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Hypothyroidism and Hypertension; Links to Consider when providing Patient Care

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Abstract

Hypothyroidism has been shown, through numerous studies, to impact the cardiovascular system including changes that result in elevations in blood pressure. This case report covers a 38-year-old female who presents with new diagnosis of hypothyroidism with an incidental finding of elevated blood pressure upon exam with no previous history of elevated BP. When patients present with symptoms of hypothyroidism, providers should consider the effects of hypothyroidism on the cardiovascular system. Conversely, when patients present with new onset cardiac symptoms, particularly new elevations in blood pressure, providers should consider the potential for hypothyroidism.

Background

The patient is a 38-year-old female who presented to clinic with symptoms indicative of potential hypothyroidism. Diagnosis of hypothyroidism was confirmed using diagnostic laboratory testing. The patient was prescribed a treatment plan, along with a follow up appointment to recheck TSH in 6 weeks.

Hypothyroidism can occur in two forms. Overt hypothyroidism (oH) is demonstrated by elevated TSH, decreased T4, and the patient experiencing symptoms consistent with the disease process. This is consistent with the presentation of the patient in this case report. The second form of subclinical hypothyroidism (sH) is often found incidentally as TSH is elevated but T4 is normal resulting in the patient not experiencing symptoms (Chaker, Bianco, Jonklass, & Peeters, 2017). Symptoms of hypothyroidism, when present, are commonly fatigue, cold intolerance, dry skin, hoarseness, constipation, and delayed distal tendon reflexes (Graiss & Sowers, 2014).

An additional finding for this patient at the time of visit was the noted elevated blood pressure (BP) of 130/80. The patient has no previous diagnosis of hypertension. She also has no history of elevated BP. While this may be an incidental finding, it is one that warrants further evaluation by the provider.

The multiple effects of hypothyroidism on the cardiovascular system, including the potential for hypothyroidism to increase blood pressure, have been extensively studied. In 2017, the American Heart Association (AHA) updated the blood pressure (BP) guidelines which lowered the threshold for what is considered hypertension (American Heart Association, 2017). The new guidelines are; Normal BP is less than 120/80, Elevated BP is systolic 120-129 *and*

diastolic less than 80, Stage 1 hypertension as systolic between 130-139 *or* diastolic between 80-89, and Stage 2 hypertension as systolic at least 140 *or* diastolic at least 90 (American College of Cardiology, 2017).

Considering these guidelines, the patient presents with a BP consistent with Stage 1 hypertension with a reading of 130/80. While the diagnosis of hypertension is not based on a one-time BP recording, it does warrant continued monitoring to rule in or rule out a diagnosis of hypertension. Initiating hypothyroidism treatment may result in lowering the patient's BP from a potential Stage 1 HTN diagnosis to the stage designated as elevated or normal (Stabouli, Papakatsika, & Kotsis, 2010).

The patient's BP should be monitored as the hypothyroidism treatment plan is initiated. This will assist in determining if her elevated BP is related to her confirmed diagnosis of hypothyroidism. If there is no decrease in future BP readings, further evaluation is needed.

Case Report

The case report is an otherwise healthy 38-year-old female who presented to clinic with primary complaints of fatigue and abnormally dry skin. She is married and has three children. She is one-year post-partum from the birth of her last child. She also reports that she does work full time out of the home, is a non-smoker and does not use alcohol.

She has no allergies, is currently taking a daily multivitamin and probiotic OTC. She has no previous history of elevated blood pressures, even during pregnancy. Family history is positive for Diabetes Mellitus Type II (father) and HTN, breast cancer, and hypothyroidism (mother). She has two siblings, both healthy.

She states that approximately 6 months ago she began feeling more tired than usual, although the fatigue does not interfere with her daily activities. She reports that she does not exercise routinely beyond activities she partakes in with her children. She sleeps an average of 6-7 hours per night. There are no aggravating or alleviating factors that patient can identify.

The additional complaint of diffuse dry skin also began approximately the same time as the fatigue. She states that she has been using lotions and creams daily to address the dry skin which improves condition temporarily. She has not experienced a rash and denies itching or redness.

Additional complaints identified during history of illness were a constant feeling of being cold. She states that she does go to health club regularly to utilize hot tub as this is the only thing that makes her feel warm. She adds that her husband has commented frequently regarding her need to turn heat on high when they are riding in a vehicle together.

Upon exam, vitals are temperature 97.8, heart rate 76, blood pressure 130/80, respiratory rate 16, oxygen saturation 99% on room air. She is alert and oriented x 3, well groomed, and in no distress. Physical exam is normal with no notable areas of concern including skin that is warm, dry, and intact, cardiovascular RRR, and thyroid smooth without nodules or enlargement.

Laboratory diagnostics ordered were Complete Blood Count (CBC) with differential, Complete Metabolic Panel (CMP), and Thyroid Panel including TSH, T4, T3 and Vitamin D. Results were CBC normal, CMP normal with exception of slightly elevated ALT 37 (normal range 0-32). Thyroid Panel showed elevated TSH at 6.610 and decreased T4 at 1.27. Elevated TSH with decreased T4 confirmed diagnosis of hypothyroidism.

Patient was started on Levothyroxine 25 mcg once daily and was directed to take in the morning with a glass of water one hour before eating. She was instructed to return to clinic for a recheck in 6 weeks. Provider also discussed the noted elevated BP of 130/80 with patient.

The patient's TSH will be checked in 6 weeks as well as a BP reading. Provider will evaluate symptom response to Levothyroxine and note BP reading. If a second elevated BP is noted, potential for diagnosis of HTN may be warranted or, at a minimum, should be monitored potentially with ambulatory blood pressure monitor.

Literature Review

As stated previously, patients with hypothyroidism generally present with the typical symptoms such as fatigue and cold intolerance. While this may be the case for a vast majority of patients whom a provider may diagnose with hypothyroidism, awareness of less common presentations and considerations should be kept in mind. This includes patients who present with symptoms indicating possible cardiac involvement, including new elevations in BP.

Regarding potential cardiac presentations of hypothyroidism, patients have been recorded as presenting with fatigue on exertion and shortness of breath and later diagnosed with hypothyroidism (Chaker, Bianco, Jonklass, & Peeters, 2017). There have even been documented cases of patients presenting with more severe symptoms such as angina, MI, and presentations consistent with pericarditis (Grais & Sowers, 2014). Approximately 4% of patients diagnosed with pericarditis are also found to have either oH or sH. Another more frequently recorded cardiac symptom noted in patient with both oH and sH is elevation in BP.

The cardiovascular symptoms are the result of the effects that thyroid hormones play on the cardiovascular system. Thyroid hormones have been identified as contributing to vascular

resistance, changes in cardiac contractility, and decreasing left ventricular function and overall cardiac output (Chaker, Bianco, Jonklass, & Peeters, 2017). Thyroid hormones also contribute to renal function with insufficient thyroid causing a reduction in GFR and free water clearance (Stabouli, Papakatsika, & Kotsis, 2010). This adds additional stress to the cardiovascular system, all of which can present as increases in BP for hypothyroid patients.

There are many publications and studies that have been completed that identify the link between hypothyroidism and hypertension. One publication, Hypothyroidism and Hypertension, from the Expert Review of Cardiovascular Therapy by Stabouli, Papakatsika, and Kotsis, is acknowledged as current considerations for the link between the two disease processes (2010). The review states that hypothyroidism is considered a cause of secondary hypertension (HTN) and that replacing thyroid hormone in hypothyroid patients can reduce BP and reduce the patients overall cardiovascular risk (2010).

Endocrine related hypertension is recognized as a secondary form of HTN. Statistics report that up to 0.4% of the general population has either oH or sH (Velasco & Vongpatanasin, 2014). When evaluating the population of those with HTN, up to 6% have oH or sH (Velasco & Vongpatanasin, 2014). This supports a strong correlation between the two disease processes.

One study, completed by Singhai and Gupta, evaluated 500 patients with a new diagnosis of hypothyroidism. They were screened for TSH and T4, as well as BMI and demographic information (2016). Results showed that patients involved in the study who were found to have sH had an average BP of 130.5/82.9 while the euthyroid subjects averaged BP of 127.3/81.1. This evidence would support the idea that a patient may potentially present to clinic with BP readings consistent with HTN. With no presenting symptoms of hypothyroidism, a TSH would

likely not be checked, leading to the potential for a diagnosis of HTN when, in fact, low TSH may be contributing.

A second study involving 64 subjects over a time period of four years showed slightly elevated BP in both oH and sH versus controls (Piantanida, et al, 2016). In a third study, referenced by Hofstetter and Messerli, a reported 50,147 patients with sH demonstrated at least a small elevation in systolic BP (2018). Along with this was the report that those patients who were treated for sH had BP that returned to normal after initiating thyroid replacement. This supports the idea that the risk for and inaccurate diagnosis of HTN may be reduced by evaluating TSH in patients presenting with new elevations in BP. It also suggests that treating the sH, when concurrently presenting with elevated BP, may be cardioprotective.

Several studies have been conducted on patients following a thyroidectomy, evaluating thyroid replacement therapy outcomes as well as clinical symptoms. It has been found that patients on levothyroxine following a thyroidectomy who cease thyroid replacement therapy have demonstrated increases in BP (Piantanida et al., 2016). These increases in BP have been reversed in those patients who reinitiate thyroid replacement therapy. Conversely, normotensive patients who underwent a thyroidectomy were found to have an increase in BP following the procedure (Piantanida et al., 2016).

Thyroid replacement therapy is Levothyroxine monotherapy. Patient who present with symptoms of hypothyroidism, as stated above, and are confirmed to have oH are treated, typically starting on a low dose and re-evaluated after 4-6 weeks (Chaker, Bianco, Jonklass, & Peeters, 2017). The recheck visit involves TSH and T4 levels and adjusting the dose accordingly to get patient to target levels. Often this target treatment is considered at a therapeutic level with the dissipation of presenting physical symptoms, leaving as many as 35-60% of patients lower

than the target TSH and T4 levels (Stabouli, Papakatsika, & Kotsis,2010). With this information, some patients treated for oH can potentially be in a state of sH even with treatment which may leave them in a state that potentially increases their cardiac risk factors.

There are known factors in pregnancy that alter the effects of TSH. These include an increase in the levels of serum thyroid binding globulin (Kattah & Garvovic, 2016). If a woman has preexisting hypothyroidism and is being treated with Levothyroxine, they will need a 30% increase in their dose during pregnancy. In addition, sH has been found to be a new development in as many as 15% of pregnancies (Kattah & Garvovic, 2016). A case presentation supporting the connection between increases in BP and sH was presented by Kattah and Garvovic (2016). A 25 year old primigravida presented to clinic at 22-weeks-gestation with increases in BP. TSH was elevated, T4 normal, indicating sH. Provider opted to start patient on Levothyroxine which resulted in decreased BP which continued to remain stable throughout the remainder of the pregnancy. Kattah and Garvovic went on to state that while universal screening of TSH is not the current recommendation, it is a reasonable consideration to draw levels with pregnant patients presenting with new onset elevating BP (2016).

While routine screenings of TSH in asymptomatic patients is not typical, the ease and low cost of completing the test may be worthwhile in patients presenting with new elevations in BP. With elevations in BP increasing a patient's overall cardiovascular risk, Grais and Sowers perspective is to screen TSH in patients that are pregnant, over age 60, have any increased risk of thyroid dysfunction including a family history, and those that present with new cardiovascular system symptoms (2014). Stabouli, Papakatsika, & Kotsis add to these recommendations by stating that adolescents with the risk factors of elevated BP, obesity, and elevations in cholesterol

be screened for hypothyroidism citing that early detection of even sH could lead to the ability to provide early reduction in the patients overall cardiovascular risk (2010).

In the presented case report of the 38-year-old female newly diagnosed with hypothyroidism and presenting with new elevation in BP, this article review provides evidence to suspect a correlation between the two. The patient was started on Levothyroxine therapy with a recheck follow up in 6-weeks. At that time, BP will be reevaluated along with TSH and T4.

Learning Points

- Providers should be aware of potential finding of elevated blood pressures in otherwise normo-tensive patients at time of hypothyroidism diagnosis.
- When new increases in blood pressure or new onset cardiac symptoms are identified in patients, subclinical hypothyroidism may be contributor and should be considered.
- Patients with identified subclinical hypothyroidism who have cardiovascular risk factors may benefit from treatment with Levothyroxine to lower those risk factors.

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