

Screening for Thyroid Disorders Among Resistant Hypertension Patients: Are We Doing Enough?

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Abstract

Objective: This is a quality assurance project to assess if hypo- and hyperthyroidism are appropriately screened for in patients with resistant hypertension.

Design: Patient data was collected from patients diagnosed with resistant hypertension, defined as being on four or more different classes of anti-hypertensive medications. These patients were filtered to determine if thyroid stimulating hormone (TSH) screening occurred within 90 days of the addition of a fourth medication class.

Setting: Two internal medicine residency clinics in Pittsburgh, PA.

Participants: Patients were selected who had a diagnosis of hypertension and were seen in clinic between January 1, 2018 to December 23, 2020.

Methods: A single center retrospective review was performed.

Results: A total of 1,125 patients were identified as having resistant hypertension. Of these, only 74 patients were found to have a TSH within 90 days of having a fourth medication class prescribed. Seven TSH values were found to be abnormal with one patient being diagnosed with hyperthyroidism, demonstrating a screening rate of 6.6%. There were statistically significant differences in age, body mass index, and diastolic blood pressure in those screened versus not.

Conclusions: Thyroid disease is under-screened as an etiology for resistant hypertension, particularly given the ease of diagnosis and reversibility of these conditions.

Keywords: Thyroid Dysfunction, Resistant Hypertension, Thyroid Screening, Primary Care

Introduction

Hypertension is the leading cause of cardiovascular deaths amongst modifiable risk factors in the United States.¹ Several predisposing as well as causative risk factors for hypertension have been identified including genetics, diet, physical fitness, vascular abnormalities, endocrine disorders and congenital defects. Regardless of etiology, it remains an extremely expensive driver of healthcare expenditures, with patients spending an extra \$2,000 per year compared to those without hypertension and total spending over \$131 billion annually.² As such, it is important to identify modifiable and treatable abnormalities associated with primary and secondary etiologies of hypertension.

Patients are classified as having resistant hypertension if four or more medications are needed for optimal blood pressure control, which often requires the use of a loop diuretic.¹ However, several factors need to be considered before diagnosing a patient with resistant hypertension including a lack of treatment adherence, white coat syndrome, high salt or alcohol intake, medication side effects, recreational drugs or secondary hypertension.³

Endocrine disorders have been shown to be a cause of hypertension in up to 10% of cases with thyroid disorders making up approximately 1% of these.⁴ Despite thyroid dysfunction being a rare cause of hypertension, it is important to recognize and diagnose given the reversible nature of thyroid associated hypertension. Current guidelines support screening for thyroid abnormalities via thyroid stimulating hormone level (TSH) on initial diagnosis of hypertension and resistant hypertension.¹ This screening method has been shown to have high sensitivity and is very cost effective.⁵ This is a quality assurance project to assess if hypo- and hyperthyroidism are appropriately screened for in patients with resistant hypertension.

Methods

A single center retrospective review was performed for the purposes of quality assurance in two internal medicine residency clinics in Pittsburgh, PA. Patients were selected who had a diagnosis of hypertension and were seen in clinic between January 1, 2018 to December 23, 2020. Patients with pre-existing thyroid problems or had prior evaluation for thyroid disorders were excluded. Patients were classified as having resistant hypertension if they were on four or more classes of anti-hypertensive medications. Baseline demographics were obtained along with date of diagnosis of hypertension, classes of anti-hypertensives, and if thyroid stimulating hormone (TSH) was obtained. Patients within the resistant subgroup were filtered to identify the rate for TSH screening within 90 days of the fourth medication class prescribed. TSH was then filtered for abnormal values defined by TSH >4.0 mcU/mL and <0.400 mcU/mL. Thyroid dysfunction was confirmed in patients with abnormal TSH with free thyroxine (T4) testing.

Statistical analysis was performed using unequal variance t-test to test for population differences between screened and unscreened patients. This project was determined to be a quality improvement project and approved by the Allegheny Singer Research Institute Institutional Review Board.

Results

A total 9,146 patients were found to have hypertension. Of these, 1,321 patients were excluded. 1,125 patients were identified who met the criteria for resistant hypertension. Their baseline demographics are shown in Table 1. The most prescribed anti-hypertensive medications were renin-angiotensin antagonists, followed by beta blockers and calcium channel blockers (Table 2). Of these patients, only 74 patients had a TSH value within 90 days of a fourth anti-

hypertensive medication being prescribed, resulting in a screening rate of 6.6%. The reasons for thyroid screening were diverse, but only 6 out of 74 patients were screened due to hypertension. Demographic differences between those patients screened and not screened are shown in Table 1. Notably, there was no statistically significant difference in screening rates based on gender or ethnic differences. There was a statistically significant difference in screening rates based on age, body mass index and diastolic blood pressure. Overall, patients who received TSH screening were older, had lower body mass indices (BMI), and had lower diastolic blood pressure (Table 1).

Out of the 74 patients who received screening, seven patients were found to have abnormal TSH values. One patient was found to have hyperthyroidism and was started on therapy. The other six patients were diagnosed with subclinical thyroid disease due to normal free T4 levels and were managed conservatively.

Discussion

It is known that hypothyroidism can result in diastolic hypertension, raising the diastolic blood pressure above 90 mmHg in some patients.⁶ Around 1% of cases of diastolic hypertension in the general population is due to hypothyroidism.⁷ Contrastingly, hyperthyroidism increases cardiac stroke volume, decreases systemic vascular resistance, increases renin release and subsequently systolic blood pressure.⁷ Unfortunately, there is limited data on the prevalence of patients with hyperthyroidism that originally present with hypertension. Older studies have suggested a 20-30% prevalence of hypertension in patients with hyperthyroidism.⁹ Although they are rare causes of hypertension, these disorders need to be identified because of the ease of screening and treatment of thyroid disorders.^{5,8}

Currently, TSH remains the initial test of choice for evaluation of thyroid disorders, with sensitivity and specificity of 98% and 92% for diagnosis of thyroid disorders.^{10,11} Furthermore, it is highly cost effective, due to it being covered by most insurance plans and the highly treatable nature of most thyroid disorders.⁵ This could potentially identify a reversible cause of their hypertension preventing them from taking and paying for 4 or more anti-hypertensive medications.

Our data shows that the screening rates for thyroid disorder in patients with resistant hypertension were under 7%. Although only one patient out of 74 screened were found to have a thyroid disorder, there remains a significant proportion of patients who were never evaluated. This could potentially lead to improper treatment with anti-hypertensive medications instead of proper hyper- or hypothyroid medical management. Although mean diastolic blood pressure was controlled in patients with resistant hypertension, we did see a statistically significant difference in screening rates. Interestingly, patients that received TSH screening had lower BMI than those without TSH testing. These patients should be screened more as thyroid dysfunction could be causing their obesity as well as their hypertension. There was no statistical difference in screening rates when comparing race, gender, or systolic blood pressure.

Limitations

Our study is a single center retrospective study, and as such may not be representative of practice patterns in larger populations. Furthermore, the outpatient clinics which were examined were residency clinics, which are fraught with issues of continuity of care, access to care, and instability of supervisory roles.^{12,13} As such, it is possible that these findings may reflect the lack of longitudinal care frequently seen in residency clinics as opposed to an under-recognition of

thyroid disorders as a potential cause of resistant hypertension. We assumed best practices and that antihypertensives were titrated up to maximum toleration prior to starting another anti-hypertensive as well as medication compliance.

We also did not evaluate other causes of resistant hypertension such as renal artery stenosis, obstructive sleep apnea, primary aldosteronism, pheochromocytoma, etc. Further studies will need to be done in order to evaluate the sensitivity and cost effectiveness of these different tests needed to evaluate these differentials. This could suggest a sequential order of evaluating causes of resistant hypertension with the bases of high value care.

Conclusion

TSH testing is highly sensitive for diagnosing thyroid dysfunction and is incredibly cost efficient. Therefore, even though they are rare causes of hypertension and resistant hypertension, thyroid disorders should be evaluated in the primary care setting.

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Figure 1: Usage of anti-hypertensive classes in patients with resistant hypertension.

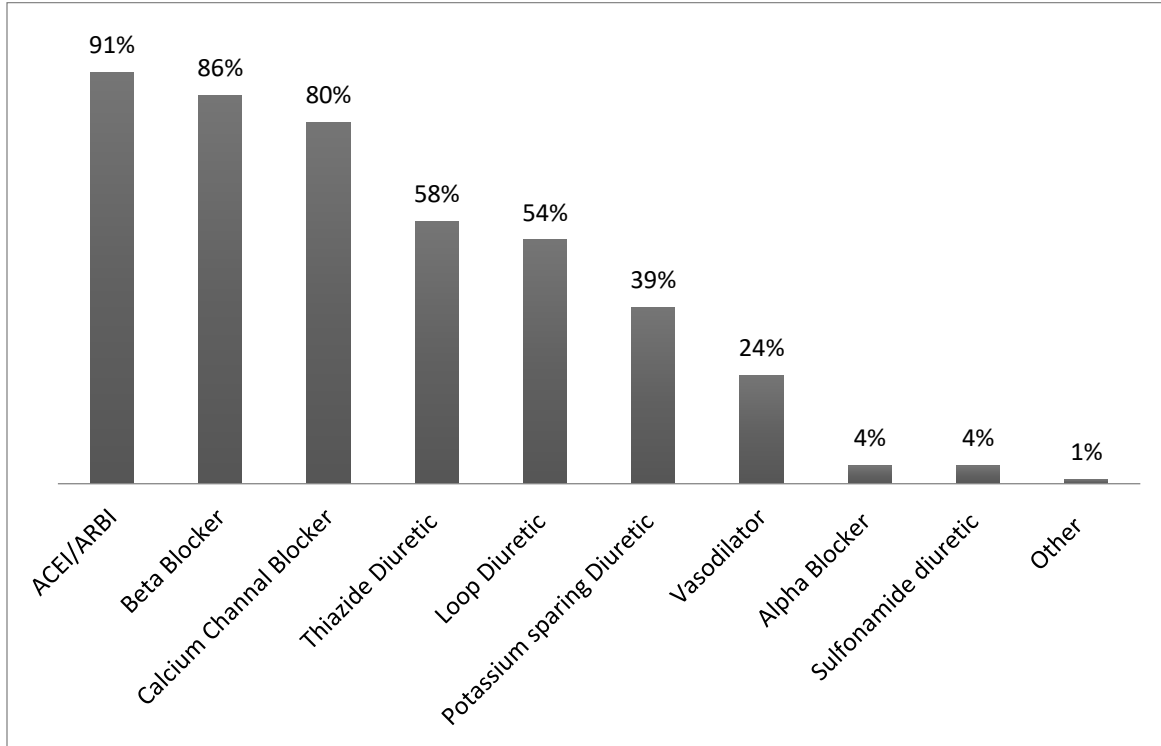


Table 1. Demographics of patients with resistant hypertension

	n (%)
Average Age (<i>years</i>)	70.7
Average Body Mass Index (<i>kg/m²</i>)	29.6
Gender	
<i>Male</i>	516 (46%)
<i>Female</i>	609 (54%)
Ethnicity	
<i>Caucasian</i>	457 (41%)
<i>African American</i>	643 (58%)
<i>Other</i>	5 (1%)

Table 2. Screening rates for thyroid disorders by demographic groups

	Screened (%)	Unscreened (%)	P value
Average Age (<i>years</i>)	71	67	0.018
Average Body Mass Index (<i>kg/m²</i>)	29.4	32.4	0.014
Gender			0.62
<i>Male</i>	36 (7)	480 (93)	
<i>Female</i>	38 (7)	571 (93)	
Ethnicity			0.27
<i>Caucasian</i>	34 (7)	423 (93)	
<i>African American</i>	37 (6)	606 (94)	
<i>Other</i>	3 (60)	2 (40)	
Blood pressure			
<i>Systolic (mm Hg)</i>	135	135	1.0
<i>Diastolic (mm Hg)</i>	76	80	0.034