CASE REPORT

Thyrotoxicosis: an under-recognised aetiology

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SUMMARY

A 53-year-old woman presented for evaluation of dizziness, shortness of breath and chest pain. She was found to be in atrial fibrillation with rapid ventricular response that was determined to be caused by iodine-induced thyrotoxicosis (from a CT scan with intravenous contrast 2 months prior to presentation). Jod-Basedow syndrome (iodine-induced hyperthyroidism) is infrequently considered as a cause of thyrotoxicosis, even when typical risk factors are present. However, this patient did not have typical risk factors: she did not reside in an iodine deficient area, did not have a prior diagnosis of thyroid disorder or goitre, had never been treated with thyroid medications or medications known to cause thyroid dysfunction and she presented later than is typical with this syndrome (2 months after receiving iodinated contrast). She had complete resolution of hyperthyroidism and atrial fibrillation 2 weeks later with no recurrence over the following 7 months.

BACKGROUND

Daily, numerous patients undergo radiological studies with iodinated contrast, and this has significantly increased over time, with the frequency of CT scans tripling over the past 15 years.[1] Jod-Basedow syndrome, or iodine-induced hyperthyroidism, is commonly unrecognised as a side effect of contrast medium, and acute thyrotoxicosis can be deadly. It typically presents in patients living in iodine deficient areas, the elderly and in those with a history of thyroid dysfunction (such as multinodular goitre).[2] This case report is important as it illustrates Jod-Basedow syndrome following iodinated contrast in a patient without any of the typical risk factors, who resides in an iodine-replete environment. This case report serves as a clinical reminder that iodine-induced hyperthyroidism is an important aetiology of thyrotoxicosis, especially given the concern that its incidence may increase over time with higher utilisation of iodinated contrast. It also illustrates that this phenomenon is not limited to high-risk patients who have previously been described and must be considered whenever clinically appropriate. Lastly, it raises additional awareness that we should be mindful of the potential adverse effects of radiographic studies with iodinated contrast that we order on a routine basis.

CASE PRESENTATION

A 53-year-old African American woman with a medical history of chronic obstructive pulmonary disease, stroke and former cocaine abuse, presented to the emergency department after experiencing a sudden onset of dizziness, shortness of breath and chest pain while at a family gathering. After half an hour, her symptoms did not resolve and an ambulance was called. She was found to be in new onset atrial fibrillation with rapid ventricular response. Her heart rate was 180 and she was given diltiazem 25 mg intravenously. In the emergency department, her heart rate remained in the 120 s and she was started on a diltiazem infusion. Her urine drug screen was negative and three sets of serial cardiac enzymes were negative over 24 h. A thyroid panel was obtained, which showed suppressed thyroid-stimulating hormone (TSH) at 0.03 mLU/L (N 0.27–4.20 mLU/L), elevated T3 at 211 ng/dL (N 80–200 ng/dL) and elevated free T4 at 1.98 ng/dL (N 0.92–1.70 ng/dL), consistent with hyperthyroidism. The patient did not have thyromegaly, thyroid nodules or thyroid tenderness on palpation. She had not been on amiodarone, interferon-α, interleukin-2 or lithium. She had no recent history of upper respiratory symptoms and remained afebrile without signs or symptoms of infection, throughout her admission. Interestingly, she had normal thyroid function just 2 months prior to admission, with TSH 1.11 mLU/L (N 0.27–4.20 mLU/L) and free T4 1.20 ng/dL (N 0.93–1.70 ng/dL). It was discovered that on a prior admission 2 months earlier, she had received intravenous contrast during CT angiogram of the chest for evaluation of pulmonary embolism. Endocrinology was consulted and determined that she had iodine-induced hyperthyroidism (Jod-Basedow Phenomenon), which can occur after receiving large doses of iodine.

The patient converted to sinus rhythm on diltiazem infusion. She was not started on antithyroidal medications, since her hyperthyroidism was expected to resolve spontaneously, but was temporarily prescribed oral propranolol with plans to continue this until her hyperthyroidism resolved. She was also not anticoagulated for her atrial fibrillation because she was found to have a transient aetiology of thyrotoxicosis, which precipitated her atrial fibrillation with rapid ventricular response. With expected spontaneous resolution of her hyperthyroidism and atrial fibrillation, risks of anticoagulation were felt to be greater than the benefits.

INVESTIGATIONS

Thyroxine binding globulin, thyroid stimulating immunoglobulin and thyroid peroxidase antibody were ordered, and were all normal at 16.4 μg/mL (normal 13.0–30.0μg/mL), 101 (normal <122) and <0.3 U/mL (normal <0.3 U/mL), respectively.

CT of the neck was performed 5 months prior to presentation (during an evaluation for peritonsillar abscess) and did not demonstrate structural abnormalities of the thyroid gland, including absence of nodules and goitre.

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DIFFERENTIAL DIAGNOSIS

Cocaine abuse can cause arrhythmias and this patient's symptoms, but she denied recent use within the past year and her urine drug screen (performed in the emergency department) was negative. Cocaine abuse is not known to cause hyperthyroidism but it has been correlated with it, raising a concern that it may potentially have a role in precipitating clinical hyperthyroidism in those with baseline subclinical hyperthyroidism. However, this patient did not have subclinical hyperthyroidism on her thyroid panel 2 months before presentation and had not used cocaine recently.

Graves' disease is the most common form of hyperthyroidism.[3] Our patient had normal TSH 2 months prior to presentation, normal thyroid stimulating immunoglobulin at time of presentation, and no clinical evidence of Graves' disease, which allowed us to rule it out as the aetiology of her thyrotoxicosis. The patient had no history of preceding viral illness and a non-painful thyroid on examination, making acute viral thyroiditis unlikely. Painless thyroiditis (subacute lymphocytic thyroiditis), a form of chronic autoimmune thyroiditis, can also present as transient hyperthyroidism in the setting of a painless thyroid, but typically (in 50% of cases) presents with elevated thyroid peroxidase antibodies, which were not present in our patient.[4] In addition, she did not have a goitre and did not develop subsequent hypothyroidism, which are also seen in subacute lymphocytic thyroiditis. Postpartum patients and patients being treated with amiodarone, interferon-α, interleukin-2 or lithium, can also present with acute, painless thyroiditis, however, our patient was not postpartum and had not taken any of these medications.[5 6]

OUTCOME AND FOLLOW-UP

The patient was asymptomatic and in normal sinus rhythm on the day of discharge. Thyroid panel had normalised by her follow-up visit 16 days later, and TSH was repeated 2 months after she had thyrotoxicosis; it remained normal. The patient remained asymptomatic and in normal sinus rhythm, without recurrence of atrial fibrillation or hyperthyroidism over the following 7 months, during which time she was evaluated seven times.

DISCUSSION

Iodine-induced hyperthyroidism is more common in iodine deficient areas and in patients with thyroid disease or multinodular goitre; however, this case report illustrates that it can also occur in patients without these risk factors. Iodine is an essential requirement for thyroid hormone synthesis and requires approximately 52 μg of iodine. The recommended daily intake is 150 μg with a high threshold of 1100 μg. Average daily intake in the USA is 150–200 μg, which makes it an iodine-replete country.[7]

In the past two decades, use of iodinated contrast media has risen dramatically with increase in cardiac catheterisation and CT. A common dose of intravenous contrast is about 13 500 μg of free iodide, with 15–60 g of bound iodine that can become free iodide.[8] This is approximately 90 to several hundred thousand times the recommended daily intake. There are nodules in the thyroid that are not dependent on TSH control and autoregulation. An excess of iodine from iodinated contrast can produce excess hormone production from follicles that do not reduce activity when TSH is suppressed.[9] Jod-Basedow phenomenon can be seen with 300–400 μg of iodide, which is less than that of iodinated contrast media. Risk increases in elderly patients and in those with underlying Graves' disease or multinodular goitre. Typically, patients will have self-limiting hyperthyroidism over a 12 month time frame and remain euthyroid after an average of 116 days. Although iodine-induced hyperthyroidism has been documented to occur 3–10 weeks after exposure to iodinated contrast, 75% of patients present within 1 month of exposure.[8 10] Our patient presented later than most and did not have the aforementioned typical risk factors for this phenomenon, which the literature uniformly notes in currently reported cases.

Patient's perspective

- "I am surprised I felt so bad and had this problem because I had that test (CT) way back when (two months prior). Did I really need that test?"
- After discussion about the need for the CT, the patient noted "I am glad it was only temporary and that I don't need to take medications forever."

Learning points

- Patients can develop Jod-Basedow syndrome after iodinated contrast even in the absence of typical risk factors such as being elderly, having underlying thyroid disease (such as Graves' disease or multinodular goitre), living in an iodine deficient area, or taking medications that affect the thyroid gland.
- Jod-Basedow syndrome is typically seen 3–10 weeks after exposure to iodinated contrast (75% of cases occur within 1 month) and is self-limiting, resolving over a 12-month period.
- Careful consideration on need of iodinated contrast for patients should be exercised.

Competing interests None declared.

Patient consent Obtained.

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