

Endemic goitre and hypothyroidism in an adult female patient dependent on total parenteral nutrition

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Summary

We present the case of a thirty-year-old female patient who was referred to the endocrinology team with an enlarging goitre and biochemical hypothyroidism. She had been dependent on total parenteral nutrition for the previous six years as a result of intestinal failure thought to be caused by possible underlying mitochondrial disease. The patient also suffers from a Desmin myopathy, and at present, the exact aetiology behind her intestinal failure is not certain. The goitre was smooth and had been enlarging slowly over the previous few months. Thyroid peroxidase antibodies were found to be within normal range. Further analysis of the case showed that twelve months earlier the patients total parenteral nutrition (TPN) feed had been altered as a result of manganese toxicity. The current feeding regimen did not contain a trace element additive which had previously supplied iodine supplementation. A little detective work established that iodine content to the TPN had been reduced, the trace element additive (Additrace) was recommenced providing 1 µmol of iodine per day, equating to 130 µg of iodine. Following this change, thyroid-stimulating hormone levels returned to normal and the goitre quickly reduced in size. We present a rare case of endemic goitre and hypothyroidism in a patient receiving inadequate iodine supplementation through total parenteral nutrition.

Learning points:

- Endemic goitre and hypothyroidism secondary to iodine deficiency are rare in the developed world. However, the diagnosis should be considered in the setting of a diffuse goitre and negative thyroid antibodies.
- Although rare, endemic goitre should be considered in patients who present with hypothyroidism and who are dependent on total parenteral nutrition.
- Treatment with levothyroxine is not required in endemic goitre as thyroid function tests generally normalise with the addition of iodine to the diet/total parenteral nutrition regimen.
- Iodine supplementation at a level recommended by the European Society for Clinical Nutrition and Metabolism (ESPEN) was observed to quickly normalise this patient's thyroid function tests.

Background

Here we present a very rare presentation of a common disease. Autoimmune hypothyroidism is widespread both in primary care and within the hospital setting, and its investigation and management is well recognised. With the exclusion of iatrogenic causes (thyroidectomy,

radiation), other causes of hypothyroidism are uncommon and are generally looked after by endocrine specialists.

Iodine deficiency in the developing world is the leading cause of hypothyroidism but is rarely encountered in developed countries due to adequate nutrition and



enrichment of foodstuffs with iodine salts. Our patient was unable to tolerate oral intake and was therefore entirely dependent on total parenteral nutrition (TPN) to meet her nutritional requirements. These patients are at risk of developing nutritional deficiencies culminating in clinically relevant disease where deficiencies occur as illustrated in this case.

Case presentation

We present the case of a thirty-year-old Caucasian female. The initial presentation was with the development of a rapidly enlarging goitre, which was noted by the patient's primary care physician. This had been progressively increasing in size for the previous ten months. The patient described symptoms of fatigue and weight gain and was found to have biochemical hypothyroidism. On assessment, there was a large smooth goitre which was clinically larger on the right side. There were no other overt signs of hypothyroidism on examination.

The patient's past medical history is complex. She developed intestinal failure in her early twenties and quickly became dependent on TPN. A diagnosis of Desmin myopathy has been made, but she is undergoing assessment at the regional genetics centre as a mitochondrial disorder is suspected. She has small bowel dysmotility for which she has a venting percutaneous endoscopic gastroscopy *in situ*. Her other comorbidities include eosinophilic granulomatosis with polyangiitis and urinary retention. The patient has been dependent on TPN for six years.

One year prior to presentation with goitre and other features of hypothyroidism, a change was made to her TPN feeding regimen. This was necessitated by the development of manganese toxicity and led to the withdrawal of a trace element supplement, Additrace.

Investigation

Initial thyroid function tests showed thyroid-stimulating hormone (TSH) of 8.2 IU/L (0.2–4.2) and free T4 of 5.9 pmol/L (11.0–22.0). These were subsequently repeated along with thyroid peroxidase antibodies (TPO) showing TSH of 8.3 IU/L and T4 of 6.1 pmol/L along with a TPO titre of <28 IU/mL. Five months later, the TSH had increased to 25.0 IU/L and free T4 was 3.1 pmol/L. A total T3 level was checked at this point, which was within normal range at 2.3 (0.9–2.5) nmol/L.

A diagnosis of iodine deficiency was considered, and the patient's feeding regimen was altered to include trace

element supplementation which contained iodine at the recommended amount. Subsequent thyroid function tests after four months showed TSH 0.65 IU/L, free T4 10.0 pmol/L and total T3 2.1 nmol/L.

Treatment

Following the findings of increasing TSH and a normal thyroid peroxidase antibody level, the patient was recommenced on Additrace, an additive containing trace elements including iodine. This was given with the TPN feed. The patient had been receiving this up until one year prior to the development of the goitre, but biochemical evidence of manganese excess had necessitated it being stopped. Prior to this change, it was confirmed she was no longer suffering from manganese toxicity.

Additrace contains 16.6 µg of potassium iodide per mL as per its summary of product characteristics. The patient was commenced on 10 mL of Additrace per day. This equates to 130 µg of iodine in the 10 mL of Additrace received over a twenty-four hour period.

Prior to it being stopped due to manganese excess, the patient was receiving a lower dose of 5 mL Additrace per day, despite which she had never experienced symptoms of thyroid dysfunction.

Outcome and follow-up

The patient attends the nutrition clinic regularly and has regular follow-up by consultant gastroenterologist. She has unfortunately had a number of recent hospital admissions due to unrelated problems, but thyroid function tests have remained normal. She is due follow up in the endocrine outpatients department as previous appointments have had to be arranged due to illness.

Discussion

Cases of hypothyroidism in adults dependent upon TPN are rare in the literature. However, there are a number of cases reported in children.

One prospective study examining the urinary iodine concentration of children from the onset of TPN found there to be a significant decrease in urinary iodine levels as time progressed (1). Although in this small study none of the patients developed biochemical hypothyroidism, follow-up was limited to twelve weeks, and it is possible that this would have subsequently developed. Cases of severe hypothyroidism have been reported in children on TPN that have been successfully treated with parenteral



iodine supplementation (2). Our case highlights that adults with similar problems can successfully be treated in the same manner.

Published guidelines by the European Society for Clinical Nutrition and Metabolism (ESPEN) outline what is considered adequate iodine supplementation for patients receiving total parenteral nutrition (3). The recommendation is that adult patients should receive 70–150 µg per day of iodine as part of their total parenteral nutrition regimen. Our patient was therefore started on what is deemed to be adequate iodine supplementation as she now receives 130 µg of iodine over a twenty-four hour period.

Interestingly, one study of patients on TPN found that only 26% of patients receiving iodine supplementation deemed adequate by ESPEN, with 19% of patients receiving iodine intake lower than that recommended, and 55% receiving no significant iodine intake at all (4). Across the whole population of that study, TSH was found to be elevated in 23% of patients with patients from both groups (those with adequate iodine replacement and those without) being represented. It would therefore appear that what can be considered as adequate intake of iodine to normalise thyroid function is variable between individuals.

The authors would urge other clinicians to consider iodine deficiency as a plausible diagnosis in patients dependent on artificial nutrition who present with a diffuse goitre and biochemical hypothyroidism.

Patient's perspective

Unfortunately, the patient has had a number of complications with her TPN feeding in recent months with admissions to hospital. However, she feels her goitre has decreased in size, and there have been no further complications related to her hypothyroidism.

Declaration of interest

The authors declare that there is no conflict of interest that could be perceived as prejudicing the impartiality of the research reported.

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Patient consent

The patient has kindly given her written consent for publication of this case.

Author contribution statement

S Pearson wrote the initial draft of the case report and performed the literature search. This author works for Dr R D Murray, the patient's primary endocrine physician. C Donnellan and L Turner are the gastroenterologists involved in the patients care. C Donnellan is her primary physician. Both were involved in the development and editing of this article. E Noble is the patients lead TPN pharmacist and helped in the research of the article. K Seejore was involved in the editing of the manuscript and research of the article. R D Murray is the patient's primary endocrine physician. Dr Murray suggested reporting this case and has been the primary editor of the manuscript.

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