

# Elevated ferritin – too much iron or not enough carbimazole?

by Peter Tenni

The patient is a 91-year-old female resident of an aged care facility who was reviewed 12 months earlier and is now being re-reviewed. She has a documented history of asthma, glaucoma, osteoporosis and has had a right sided stroke. When she was reviewed 12 months ago her medications were as follows:

- Bitamprost eye drops 0.3mg/mL 1 drop both eyes each night
- Carbimazole 5mg each morning
- Cholecalciferol 25mcg (*Ostelin*) 1 each morning
- *Coloxyl with Senna* 2 tablets three times daily when required (used rarely)
- Digoxin 125mcg each morning
- Ferrous sulphate 325mg daily
- Frusemide 20mg each morning
- Ipratropium 250mcg/mL via nebuliser four times daily
- Paracetamol 500mg-1000mg each morning
- Ramipril 5mg daily
- Salbutamol 5mg/mL 2.5mg via nebuliser four times daily
- Temazepam 10mg each night

As can be seen, the documented history was incomplete, as her medications indicate possible heart failure (with or without atrial fibrillation), hyperthyroidism and iron deficiency in addition to her documented problems. Her blood pressure and heart rate were normal, and all available biochemistry was normal. She had a low-normal haemoglobin (116g/L) approximately six months earlier. At that time, a number of recommendations were made in a written report to the prescriber, which were later discussed by phone. These are listed below:

- Antiplatelet therapy – consideration of the addition of an antiplatelet agent in view of her previous stroke and possible atrial fibrillation.
- Carbimazole – A review of the thyroid function tests was advised, with a view to stopping this medication.
- Iron replacement – A review of the haemoglobin and iron stores was suggested, with a view to ceasing the iron if possible.
- Asthma – Consideration to an inhaled corticosteroid or a combination product for her asthma in preference to the nebulised solutions.

When she is reviewed on this occasion, the only changes to her medications consist of the addition of aspirin 100mg daily and *Poly Visc eye ointment*, and the cessation of ramipril (hypotension). Additional laboratory tests had been conducted and these are shown below in addition to her previously known tests:

Lab Test	18 months ago <small>(basis for previous review)</small>	6 months ago	3 months ago	Normal Range
Sodium	140			134-146mmol/L
Potassium	5.1			3.4-5.3mmol/L
Urea				8-8.0mmol/L
Creatinine	76			45-90mcmol/L
Haemoglobin	116	120		115-155g/L
Mean Cellular Volume	87	89		80-100fL
Ferritin		399	370	30-210mcg/L
Serum Iron		8	11	11-24mcmol/L
Transferrin		16	17	20-45mcmol/L
TSH			<0.0004	0.35-4.94pmol/L
T3			5.4	2.5-5.5pmol/L
T4			17.8	10-24mol/L

As can be seen, the iron studies and thyroid studies were abnormal at the time of testing. The nursing staff describe the lady as 'feisty', and she is frequently agitated and irritable. She has also had a significant amount of weight loss over the past 12 months and is now described as 'skinny as a rake'.

## Clinical assessment

There are two clinical issues which appear initially to be unrelated – her thyroid function tests and her iron studies.

The extremely low thyroid stimulating hormone (TSH) level indicates physiological hyperthyroidism, despite a normal T3 and T4 level. Reduced binding of the T4 and T3 may explain the physiological response. Given that her symptoms are at least partially consistent with hyperthyroidism, it would appear logical to increase her carbimazole dose in order to control this.



The elevated ferritin level is interesting, given that she has been taking iron supplements for at least 12 months with a normal haemoglobin level. Although ferritin increases as a result of iron overload (haemosiderosis), ferritin is an acute phase reactant that can also increase in a range of situations.<sup>1</sup> Iron studies may be altered by infection, inflammation, liver disease, malignancy or malnutrition.<sup>2</sup>

The other iron related tests can assist in determining whether the elevated ferritin is related to excessive iron or to other causes. In Table 1, a comparison of the iron studies in different clinical situations is shown.

Table 1: Iron studies in different clinical situations (Modified from reference<sup>3</sup>)

Clinical condition	Serum iron	Serum ferritin	Serum transferrin
Iron deficiency anaemia	Low	Low	Low
Acute phase response	Low	High	Low
Iron overload	High	High	High

In this patient, the low/normal serum iron and low transferrin is not consistent with iron overload, and is more likely to be associated with some underlying disease process.<sup>3</sup> The relationship between hyperthyroidism and ferritin is unclear, but it is known that one of the causes of low ferritin is hypothyroidism.<sup>2</sup> It may, therefore, be possible that hyperthyroidism is associated with hyperferritinaemia.

It seems that in this case, the elevated ferritin is not related to excessive iron and that the single main issue is the potential hyperthyroidism.

### Actions and recommendations

Although there are some other potential drug related issues in this person, a major concern is the biochemical hyperthyroidism that seems to be resulting in some clinical symptoms. It would be appropriate to discuss with the prescriber the need for a physical examination and repeat laboratory tests to confirm the existence of hyperthyroidism (most likely due to nodular goitre). Given her age, the likely management would be to increase the dose of the carbimazole with appropriate monitoring of TSH. Although the elevated ferritin may be unrelated to iron intake, it would seem that it is unnecessary, given the patient's haemoglobin and MCV and occasional use of laxatives.

Another point worth discussing in this case is the uptake of the recommendations from the first review. The GP concerned had a phone discussion with the reviewing pharmacist, after



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receiving the written report. At the time it was indicated that the suggestions would be considered, but it seems that several months elapsed before the relevant laboratory tests were conducted, or other changes were made.

The most recently conducted laboratory tests seem to have been undertaken in order to investigate weight loss reported by the nursing staff, and the abnormally low TSH would normally have been addressed. It is interesting to contemplate what the thyroid function tests would have shown at the time of the last review, as earlier detection of the thyroid issue may have avoided some symptoms for the patient.

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### References

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CPD questions on page 166-8.