Case 4

Table 1: Causes of anomalous TFTs in patients receiving levothyroxine therapy

TFT patterns/LT4 dosage requirements	Cause
A. Normal TSH, mildly ↑ FT4; (± higher than predicted L-T4 requirements)	Normal physiological variant
B. ↑TSH, low normal or ↓FT4; (Requirement for high L-T4 dosages to normalise TSH)	(i) Maladministration (ii) Malabsorption syndromes (iii) Increased TH metabolism or excretion (iv) Increased TH binding capacity
C. Unexpected change in L-T4 dosage requirements to maintain clinical and biochemical euthyroidism	Change in LT4 preparation
D. ↑TSH, normal FT4	TSH assay interference
E. Persistent [TSH, with ↓, ↑or normal FT4, despite treatment with high L-T4 dosages	Poor compliance
F. Supraphysiologic L-T4 required to normalise TSH, but with resultant ↑FT4 (and ↑FT3)	Resistance to thyroid hormone

Table 2: Causes of ↑TSH, low normal or ↓FT4 in patients receiving levothyroxine therapy

Maladministration	Patients should be advised to take L-T4 on an empty stomach; certain foodstuffs (e.g. fibre, espresso coffee) and some medications (e.g. iron, calcium, PPIs, sucralfate, aluminium hydroxide, cholestyramine, colestipol) may impair L-T4 absorption
Malabsorption syndromes	L-T4 malabsorption occurs with coeliac disease, achlorhydria, lactose intolerance (lactose is a constituent of some L-T4 preparations)
Increased TH metabolism or excretion	Phenytoin, carbamazepine, phenobarbitone, rifampicin and some tyrosine kinase inhibitors (e.g. Imatinib) increase L-T4 requirements by enhancing hepatic metabolism of TH; occasional cases of increased urinary TH loss complicating nephrotic syndrome have also been reported
Increased TH binding capacity	Oral estrogen therapy or gonadotrophin-induced rise in estrogen concentrations (e.g. IVF treatment) results in a marked increase in TBG and hence TH binding capacity, necessitating an increase in L-T4 therapy; similar effects are seen with SERMs and mitotane

Levothyroxine Absorption Test

Indication: To assess poor oral absorption of levothyroxine (LT4), and assist the clinician in differentiating true malabsorption from pseudomalabsorption (patient nonadherence).

Preparation: Ten-hour fasting.

Materials Needed: Hep-lock/syringes/needle, 1000 mcg of LT4

Blood tubes for total or freeT4 measurement

Precautions: Supervise patient continuously during the procedure.

Interpretation:

Absorption is calculated by using the following formula :

$$\%\,\mathrm{LT4\ absorption} = [(\mathrm{peak}\Delta\ \mathrm{Total\ or\ free\ T4} \times \mathrm{vd\,(dL)} \div \mathrm{administered\ dose\ of\ LT4\ (\mu g)}] \times 100].$$

Volume of distribution (Vd) in deciliters: 4.42 × body mass index [1].

More than 60–80 % absorption is considered normal and rules out levothyroxine malabsorption.

Procedure:

1. Perform the test after an overnight fast.
2. Hold all nonessential medications.
3. Insert hep-lock and flush with 3–10 ml of normal saline as necessary.
4. Have patient ingest 1000 mcg of levothyroxine.
5. Draw blood for total T4 levels at baseline before ingestion of LT4.
6. Draw blood for total T4 levels hourly for 5 h.
7. Monitor BP and heart rate hourly.
8. Document the dose and time of LT4 given and also document the lab results with timings.
9. Discontinue hep-lock.

References

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