

THYHEART – Thyroid hormones and resting heart rate: an exploratory pilot study in Grave's disease and hyperthyroidism

Egger, B.; Riedmann, U.; Pilz, S.

Division of Internal Medicine II, St. John of God Hospital Graz; Division of Endocrinology and Diabetology, Medical University Graz

Background and Aims

Graves' disease is the most common cause of **hyperthyroidism**. It is a multisystem **autoimmune disorder** characterized by TSH-receptor antibodies that stimulate the thyroid gland to **increased synthesis** and release of **thyroid hormones** (see figure 1). Grave's disease often manifests through symptoms as nervousness, weight loss or **increased heart rate**. This study aims to investigate the correlation between **free thyroid hormone levels** and **resting heart rate** measurements using a **wearable activity tracker** in patients diagnosed with Grave's disease. It also aims to explore how resting heart rates change during the treatment of **thyrotoxicosis**.

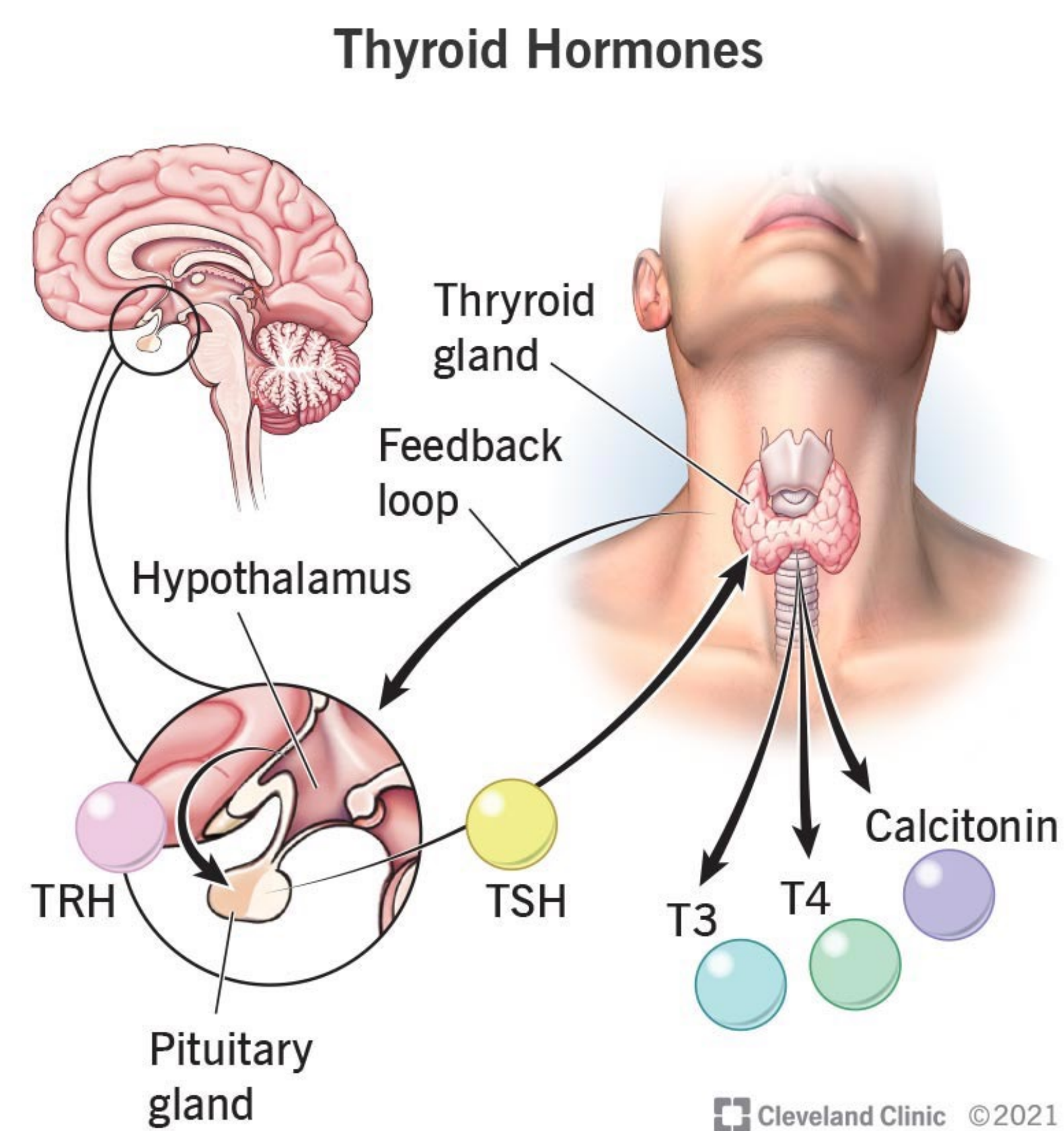


Figure 1 : Thyroid hormones;
<https://my.clevelandclinic.org/health/articles/22391-thyroid-hormone>

Patients and Methods

In this exploratory pilot study **thirty patients** diagnosed with Grave's disease from the thyroid outpatient clinic from **St. John of God hospital** (BHB Graz) and the **Medical University of Graz** were observed during a period of **6 months**. **Thyroid hormone levels** (serum free T3 and free T4) are measured **4-weekly**, and the **resting heart rate** is measured continuously by a **wearable activity tracker** (Fitbit Charge 6). We will analyze the **correlation** between thyroid hormone levels and resting heart rate. The course of the study is shown in figure 2.



Figure 2: Course of the study

Contact

Dr.med.univ. Beatrice Egger
Barmherzige Brüder Graz, Marschallgasse 12, 8020 Graz
beatrice.egger@bbgraz.at
0316/7067-26578

Case 1 – 39 old female patient with Grave's disease

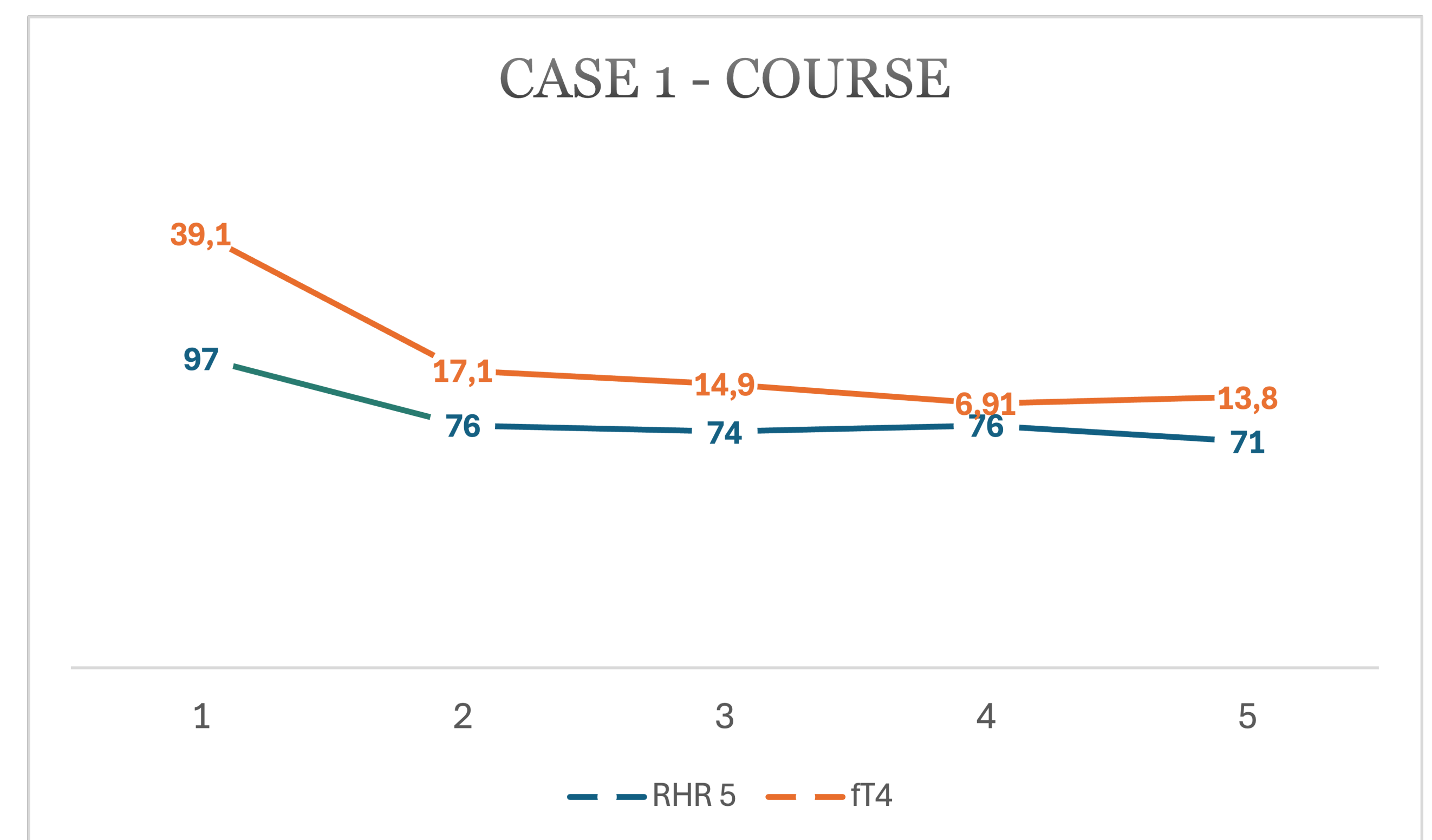


Figure 3: Course of the resting heart rate (bpm) and fT4 serum levels (pmol/l); Visit 1-5

Results and discussion

In case 1 (see figure 3) a **39-year-old female** patient presented with symptoms of nervousness, **tachycardia**, and sweating. A diagnosis of **Graves' disease** was confirmed through thyroid ultrasound, laboratory markers (TRAb antibody and serum hormone levels) and thyroid scintigraphy (Tc99-99m). The patient was prescribed **methimazole** and was scheduled for follow-up evaluations every **four weeks**. The orange line in figure 3 represents the patient's **fT4 serum levels**, while the blue line illustrates her **resting heart rate**, measured using a Fitbit Charge 6 activity tracker. The resting heart rate data is averaged over 5 days before and after each blood sample.

Preliminary observations suggest that there is a **correlation** between high thyroid hormone levels and increased resting heart rate. Recruitment status is ongoing. **Final results** are expected by the end of 2025.

Conclusion

In conclusion, **resting heart rate** could serve as a **valuable tool** for monitoring patients. If a significant correlation between **thyroid hormone levels** and resting heart rate is established, it could provide a simple and **easily accessible method** for assessment.

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