

Do abnormal thyroid stimulating hormone level values result in treatment changes? A study of patients on thyroxine in one general practice

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SUMMARY

Background. Hypothyroidism is a common disorder, easily treated with thyroxine therapy. Thyroid stimulating hormone level assay can detect under- or overtreatment.

Aim. A study was carried out in one general practice to discover the number of people on thyroxine therapy, their care, and whether abnormal thyroid stimulating hormone level values resulted in alterations to their thyroxine dose.

Method. The study was undertaken in a north Suffolk general practice of 7640 patients. A computer search identified patients receiving repeat prescriptions for thyroxine therapy and their notes were studied. A thyroid stimulating hormone level value in the range of 0.3–3.8 mU l⁻¹ was considered to indicate an appropriate thyroxine dose.

Results. Thyroxine was being taken by 162 patients (2%), of whom 146 were women. Thyroid stimulating hormone level had been checked within the last year for 127 patients (78%). At their last thyroid stimulating hormone level test, 48 patients (30%) had a value above the normal range, only 21 of whom (44%) had their thyroxine dose increased as a result. The thyroid stimulating hormone level was below 0.3 mU l⁻¹ at the last check in 38 patients (23%), only four of whom (11%) had their thyroxine dose reduced as a result.

Conclusion. There is often failure to adjust thyroxine dose despite abnormal thyroid stimulating hormone levels. However, more research is needed to determine the ideal thyroid stimulating hormone levels which should be aimed for in these patients, and whether tight control of thyroxine dosage is able to reduce morbidity and mortality among patients with hypothyroidism.

Keywords: hypothyroidism, drug dosage, management of disease.

Introduction

HYPOTHYROIDISM is a common disorder, which is easily treatable. However, there is still debate about how thyroxine treatment should be monitored. Some authors regard clinical assessment (a full history and clinical examination by a physician experienced in thyroid disease and use of the modified Wayne clinical diagnostic index) as the best means of monitoring thyroxine dose.¹ Most, however, consider thyroid function tests, particularly thyroid stimulating hormone assay, to be more sensitive.² If this is so, what thyroid stimulating hormone value range should be regarded as the optimum for these patients? Elevated levels of thyroid stimulating hormone as a result of untreated and undertreated hypothyroidism are associated with raised chole-

sterol and blood lipid levels³ and an increased risk of coronary heart disease.⁴ However, overtreatment with thyroxine may also be deleterious. It has been shown that there is an increased rate of loss of bone density in patients treated with thyroxine at doses suppressing endogenous thyroid stimulating hormone,^{5,6} although not all studies have confirmed this.⁷

The American Thyroid Association has recommended that the goal of thyroxine therapy is to normalize the thyroid stimulating hormone concentration.⁸ However, it is still not certain from current evidence that keeping thyroid stimulating hormone in the normal range should be the prime aim of thyroxine treatment monitoring,⁹⁻¹¹ nor is it clear how frequently thyroid stimulating hormone levels should be checked. These unresolved issues mean that one cannot state definitively what should be involved in the optimum management of patients on thyroxine.

A study was undertaken to determine the number of people receiving thyroxine therapy in one general practice, their care, and whether an abnormal thyroid stimulating hormone level value resulted in alterations to their thyroxine dose.

Method

The study was carried out in a general practice in north Suffolk with a list size of 7640 patients including a high proportion of elderly patients (20.3% aged 70 years or more). All repeat prescribing in the practice is done on computer, and all patients taking thyroxine were identified by a computer search in June 1993. Over the following month the notes of all these patients were examined. A form was devised on which was recorded the patient's age and sex, when the patient was last seen by a doctor, the present dose of thyroxine being prescribed, the dates and values of the last two thyroid stimulating hormone tests and whether the thyroxine dose had been altered as a result of these tests. For the purposes of this study it was decided to consider a recent thyroid stimulating hormone value within the normal reference range for the local laboratory (0.3–3.8 mU l⁻¹) as the major criterion indicating appropriate thyroxine dose.

Results

There were 162 patients receiving repeat prescriptions for thyroxine out of a total list of 7640 patients (2.1%). Of those on thyroxine, 146 (90.1%) were women. An age breakdown of the male and female patients in the practice and those on thyroxine are shown in Table 1. The highest prevalence of thyroxine therapy was in the 70–79 years age group.

Nine patients had been started on thyroxine therapy before 1960, 18 between 1960 and 1969, 16 between 1970 and 1979, 57 between 1980 and 1989, and 61 in 1991 or later (date not recorded for one patient). Of the 122 patients diagnosed in 1978 or later, 108 (88.5%) had their thyroid stimulating hormone level checked prior to starting treatment. Only one patient diagnosed before 1978 had the thyroid stimulating hormone level checked before treatment. The thyroid stimulating hormone values recorded before starting thyroxine are shown in Table 2.

Five patients (3.1%) had not been seen by a general practi-

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Submitted: 12 April 1994; accepted: 9 August 1994.

© British Journal of General Practice, 1995, 45, 93-95.

Table 1. Age and sex distribution of all patients in the practice and of those receiving thyroxine therapy.

Age (years)	No. of			
	Males		Females	
	In practice	Receiving thyroxine	In practice	Receiving thyroxine
<20	772	0	765	0
20-29	415	0	385	1
30-39	459	1	439	7
40-49	493	2	468	15
50-59	402	3	427	17
60-69	510	5	551	37
70-79	452	4	550	50
80-89	176	1	310	17
90+	18	0	48	2

tioner for any reason in the last 12 months, and all of these had been seen within the last two years. One hundred (61.7%) had been seen within the previous three months. Of all the patients, 137 (84.6%) had been seen within the last six months.

One hundred and twenty seven patients (78.4%) had had their thyroid stimulating hormone level checked within the previous 12 months and 22 had had it checked in the last 1-2 years. However, 11 patients (6.8%) had not had their thyroid stimulating hormone level checked within the last two years, and of these five had had no test within the last five years. Two patients had no thyroid stimulating hormone value recorded at all.

Forty eight patients (29.6%) had a thyroid stimulating hormone level of over 3.8 mU l⁻¹ at the last test, of whom 21 had their thyroxine dose increased after the abnormal result had been obtained, including five patients who were started on thyroxine. Six of these 48 patients had not had their thyroid stimulating hormone level checked within the last year.

Thirty eight patients (23.5%) had a thyroid stimulating hormone level of less than 0.3 mU l⁻¹ at the last check, four of whom had their thyroxine dose reduced as a result. Twelve of these 38 patients had not had their thyroid stimulating hormone level checked within the last year.

Discussion

The prevalence of thyroxine treatment found in the study practice was comparable to that in previous studies in the West Midlands,¹² Sweden¹³ and the United States of America.¹⁴ Twelve patients had been started on thyroxine despite having a pre-treatment thyroid stimulating hormone level of 5.0 mU l⁻¹ or

Table 2. Thyroid stimulating hormone (TSH) level values recorded in patients' notes prior to commencement of thyroxine treatment.

TSH level (mU l ⁻¹)	% of patients (n = 109) ^a
0.3-3.8	0.9
3.9-5.0	10.1
5.1-10.0	28.4
10.1-25.0	18.3
25.1-50.0	10.1
>50.0	32.1

n = number of patients. ^aThyroid stimulating hormone level prior to treatment not recorded for 53 patients.

less, although only one patient had a level below 3.9 mU l⁻¹.

The study found almost all patients on thyroxine (97%) had been seen by a general practitioner within the last year, and that most had had their thyroid stimulating hormone level checked within this time (78%). A large proportion of patients had a thyroid stimulating hormone level outside the target range at their last check: 30% had a raised level and 23% had a low level. These are similar to the findings of the West Midlands study where 27% of patients on thyroxine had a high thyroid stimulating hormone level and 21% had a low level.¹² The study from the USA found that 37% of patients had a thyroid stimulating hormone level above 10.0 mU l⁻¹ despite thyroxine therapy.¹⁴

Thyroid stimulating hormone levels that were out of range were, surprisingly, often ignored. Twenty seven out of 48 patients (56%) who had a raised thyroid stimulating hormone level at the last check had no increase made to their thyroxine dose. In some cases a raised level may be a result of patient non-compliance rather than an inappropriate prescribed dose. Nevertheless, only once or twice was an explanation recorded in the notes indicating why thyroxine dose had been kept unchanged despite an abnormal thyroid stimulating hormone result. Low thyroid stimulating hormone values were disregarded even more often: in 34 of 38 cases (89%). Regular testing of thyroid stimulating hormone level is of little value if no explanation for abnormal results is sought and no remedial action taken.

The optimum thyroid stimulating hormone level range for patients on thyroxine is yet to be demonstrated conclusively. This complicates the task of audit, since an important part of the audit cycle is the setting of goals, against which actual practice is compared. Whatever goals are chosen may have to be altered in the light of future research, but it is probably preferable to choose over-stringent goals. To achieve optimum therapy it will also be necessary to relate thyroid stimulating hormone levels in patients receiving thyroxine to clinical outcome measures, including osteoporotic fractures, coronary heart disease and overall mortality. It is likely that the optimum range will be slightly different for patients of different weight and sex. For example, an underweight woman is at higher risk of osteoporosis and at lower risk of cardiovascular disease than an overweight man; thus the woman's thyroid stimulating hormone level is probably better maintained at a higher level. Other factors may also be relevant, such as age and smoking status. Elderly people are at higher risk of cardiovascular disease and osteoporosis, and so more likely to benefit from tight control of thyroid stimulating hormone levels. A large prospective study is needed relating thyroid stimulating hormone levels in patients on thyroxine to clinical outcomes, with adequate sub-group analysis and long-term follow up.

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Acknowledgement

I should like to thank my trainer, Dr David Johnston, for his help and encouragement with this project.

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