Hyperthyroidism due to inappropriate TSH secretion with associated hyperprolactinaemia—a case report and review of the literature

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Summary

A patient with inappropriate thyrotrophin (TSH) secretion is described. She initially presented with classical hyperthyroidism during pregnancy, responded to propylthiouracil and, subsequently, had a normal delivery. Hyperthyroidism persisted and 7-5 months later a subtotal thyroidectomy was performed. After a further 16 months, mild symptoms of hyperthyroidism recurred. She again responded to propylthiouracil, but developed galactorrhoea. At that stage, it was noted that she had persistently elevated circulating TSH in the presence of elevated $T_4$ and $T_3$ levels. Her symptomatology was mild, although objective indices of thyroid activity, including pulse rate, BMR, sex hormone binding globulin and cholesterol, were indicative of hyperthyroidism. CT scan and tomography of the sella were normal.

She had a markedly exaggerated TSH response to thyrotrophin releasing hormone (TRH). Basal TSH and responsiveness to TRH was suppressed by high dose dexamethasone. The TSH response to TRH was partially suppressed by exogenous $T_3$, but there was no effect on basal TSH levels. TSH also decreased slightly with L-dopa and bromocriptine. Circulating TSH rose markedly during methimazole administration. TSH $\alpha$ and $\beta$ subunits were elevated and appropriate for the high TSH. In addition, both subunits increased following TRH. The patient had basal hyperprolactinaemia with an impaired prolactin (PRL) response to TRH and metoclopramide. PRL suppressed with L-dopa and bromocriptine. The remaining anterior pituitary function was intact. Most of the laboratory findings argue against the presence of a TSH producing pituitary tumour and the most likely cause for inappropriate TSH secretion in this patient is selective resistance of the thyrotroph to thyroid hormones. A mild element of peripheral resistance might also be present. The hyperprolactinaemia could be related to lactotroph resistance to thyroid hormone.

The complexities of treatment in this patient are stressed. Therapy was initially attempted with low dose dexamethasone, but this had no effect. $T_3$ treatment produced an exacerbation of her symptomatology and did not influence basal TSH, thyroid hormones, or $^{131}$I uptake. Bromocriptine administration for 11 months partially suppressed basal TSH without influencing $T_3$, and there was an increase in $T_4$. Methimazole did decrease her $T_4$ and $T_3$, but TSH and PRL rose to even greater levels. Her hyperthyroidism was eventually controlled with an ablative dose of $^{131}$I. Thyroid hormone will be given in an attempt to suppress her TSH.

KEY WORDS: pregnancy, thyroidectomy, galactorrhoea.

Introduction

In the classical forms of hyperthyroidism due to Graves' disease, toxic adenoma or toxic multinodular goitre, thyrotrophin (TSH) levels are suppressed and there is no increase in TSH following the administration of thyrotrophin-releasing hormone (TRH) (Condille and Weintraub, 1979; Gershengorn, 1981; Shenkman, Mituma and Hollander, 1973). In some instances, hyperthyroidism may be associated with inappropriate secretion of TSH. This occurs in a patient whose basal or TRH-stimulated serum concentration of immunoreactive TSH is inappropriately elevated in the presence of elevated, free serum thyroid hormones (Gershengorn, 1981). Many of

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these patients have an associated pituitary tumour (Condiliffe and Weintraub, 1979). We now present a patient with hyperthyroidism and inappropriate TSH secretion who also had mild basal hyperprolactinaemia without any evidence of a pituitary tumour. The complexity of therapy in this syndrome in general and in this patient in particular is emphasized.

Methods

Serum TSH, luteinizing hormone (LH), follicle stimulating hormone (FSH), prolactin (PRL), and growth hormone (GH) were determined by previously described methods (LeRoith et al., 1981; Spitz, Gonen and Rabinowitz, 1979; Spitz et al., 1980). The normal range for basal TSH in our female controls is 1-8-6-0 μu/ml. Following 200 μg TRH intravenously (i.v.), the peak TSH response ranges from 12-38-7 μu/ml. TSH α and β subunits were measured according to Kourides et al. (1975, 1977). Total thyroxine (T₄), total tri-iodothyronine (T₃) and T₃ resin uptake (T₃RU) were measured using test kits supplied by Dr S. Zierling, Diagnostic Products Corporation, Los Angeles, California. In our laboratory, the normal range for T₄ is 60-155 nmol/l, for T₃ from 1-15-3-38 mmol/l and for T₃RU from 25-37%, respectively. The T₃RU gives an assessment of the concentration of unsaturated binding sites on thyroid binding globulin (Ingbar and Woeger, 1974). Free T₄ levels were measured by a kit supplied by the Radiochemical Centre, Amersham, England. The normal range is from 0-92-1-96 ng/100 ml. Sex hormone binding globulin was estimated by the method of Mickelson and Petra (1974).

Case report

In March 1977, at the age of 22 years, during pregnancy, the patient developed severe palpitations together with syncope. On examination she had tachycardia, a slight tremor, and a smooth uniformly enlarged thyroid gland. Her T₄ was 245 nmol/l and her T₃ 6-39 nmol/l. She was treated with propylthiouracil 400 mg daily (Fig. 1). The tachycardia and other symptomatology subsided and she had an uncomplicated pregnancy with a normal delivery. Propylthiouracil was continued for a further 5 months. By then, the patient was clinically and biochemically euthyroid. Three weeks after withdrawing propylthiouracil, a tracer dose of ¹³¹I was given and thyroid uptake was measured at 2 hr (35%) and 24 hr (70%). Propylthiouracil was recommenced and 2-5 months later, in February 1978, the patient underwent a subtotal thyroidectomy, preceded by a short course of Lugol's iodine. A total of 68 g of thyroid tissue was removed and a minimal amount was left in situ. Histological examination showed large, irregular acini of different sizes, some of which were distended. The epithelial cells lining the acini showed supranuclear vacuolization, indicative of hyperactivity.

The patient remained asymptomatic for 16 months with no medication. In January 1979, ¹³¹I uptake was 27% at 2 hr and 47% at 24 hr. ⁹⁹Te scan showed diffuse regeneration of both lobes of the thyroid. Thereafter, T₄ levels gradually increased and by July 1979, she was complaining of palpitations and moist hands. There was no exopthalmos or tremor. Propylthiouracil was recommenced with amelioration of her symptomatology and reduction in T₄ levels. However, her white count decreased to 3,300/cm³ and treatment was withheld. T₄ levels again increased, PRL and TSH levels were found to be elevated, and tachycardia returned. Galactorrhoea was noted for the first time and she was referred to Jerusalem for further evaluation in January 1980.

At that stage, the patient's complaints were palpitations and heat intolerance. She also had mild nervousness and generalized weakness. There was no excess sweating. Appetite was normal and there was no weight loss. On physical examination she had persistent tachycardia which ranged from 96-120/min. Her blood pressure was 150/80 mmHg. She had a thyroidectomy scar with a diffusely enlarged symmetrical nodular non-tender thyroid gland. There was mild sweatiness of her palms with no tremor. Galactorrhoea was present in both breasts. There were no signs of ophthalmopathy, nor pretibial oedema. Visual fields were full.

Results

Thyroid hormone concentrations

In 17 samples, basal T₄ levels ranged from 190-329-5 nmol/l and T₃ total from 4-61-10-55 nmol/l. Serial dilution of the patient's serum gave results parallel to the standard curves in the T₄ and T₃ immunoassays. T₄ and T₃ levels were also measured in four additional radioimmunoassay test systems utilizing different antisera and various methods of separation. A competitive protein binding technique was also used to measure T₄. All these tests gave values exceeding the controls. Thus the high levels of thyroid hormones did not represent iodoproteins other than T₄ or T₃. Free T₄ levels were 3-8, 4-6, and 6-0 μg/100 ml, which is also greater than the controls. T₃RU levels in six samples ranged from 35-44-2% (P<001 compared to the controls).

No antibodies were detected against thyroglobulin, thyroid microsomal or cytoplasmic agents. The ¹³¹I uptake was 54% at 2 hr and 65% at 24 hr. The scan showed regeneration of both lobes. Basal metabolic rate (BMR) measured +15%, +19%, +24% (normal
range -5 to +15%). Serum cholesterol ranged from 3.3-3.8 mmol/l (normal range 3.8-6.5 mmol/l) and sex hormone binding globulin from 84-134.6 pg/ml (upper normal limit being 50 pg/ml).

**TSH levels**

Mean ± s.d. basal TSH levels determined in 25 samples in the untreated state in the patient were 22.7 ± 8.1 μU/ml (range 11.3-40.5 μU/ml). This was significantly greater than the female controls ($P<0.001$). The patient was challenged with TRH (200 μg) on six occasions in the basal state (Fig. 2). In all instances, the peak response was much greater ($P<0.001$) than the normal females. The patient's TSH was immunologically identical to the pituitary TSH standard (68/38) as demonstrated by parallelism between curves generated with serial dilutions of the patient's serum and the TSH standard in the assay. Sephacryl G200 gel chromatography on the patient's serum showed that the TSH immunoreactivity eluted in a position corresponding to the TSH standard.

**Subunit studies (Table 1)**

Mean TSH α and β subunit levels were greater in the patient than in female controls, and were similar to patients with primary hypothyroidism. Following TRH administration there was a definite increase in both TSH α and β subunits. The values attained were greater than the controls and similar to female patients with primary hypothyroidism.

**Further studies (Table 1, Fig. 3)**

Basal LH and FSH levels, as well as their responses to LHRH (100 μg) were normal. GH levels increased after both L-dopa and bromocriptine administration (Fig. 3). Basal PRL levels were elevated and the mean in 26 samples was 30.6 ± 14.5 ng/ml. This was greater than the female controls ($P<0.001$) where the mean is 9.5 ± 3.3 ng/ml. PRL suppressed after L-dopa and bromocriptine (Fig. 3). There was, however, an attenuated PRL response to TRH (Fig. 2) and metoclopramide (Table 1). X-ray skull with polytomograms of the pituitary fossa, as well as computerized tomography of the brain, including coronal sections with contrast enhancement, were normal.

**Dexamethasone administration**

The patient was given 2 mg dexamethasone every 6 hr for a total of four doses. When challenged 2 hr
Hyperthyroidism due to inappropriate TSH secretion

FIG. 2. TSH (●—●) and PRL (○—○) responses to TRH (200 μg) in patient throughout period of observation. Responses in normal female controls (mean ± s.e.m.) are shown in the first panel: noRx indicates no treatment. T3(a) = test after T3 (50 μg daily) for 1 week; T3(b) = test after T3 (100 μg daily) for 2 weeks; METH = test during methimazole; DXM(a) = test after 5 mg dexamethasone; DXM(b) = test after 1 mg dexamethasone daily for 1 month; bromocriptine = test after 2 weeks and 23 weeks of treatment with bromocriptine. Scale of PRL has been changed for the test during methimazole administration.

TABLE 1. Basal and peak hormonal values

<table>
<thead>
<tr>
<th>Stimulus</th>
<th>Hormone</th>
<th>Basal</th>
<th>Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>LHRRH (100 μg)</td>
<td>LH (miu/ml)</td>
<td>P* 30-1</td>
<td>53-6</td>
</tr>
<tr>
<td></td>
<td>C† 20-4±10-2</td>
<td>67-8±28-7</td>
<td></td>
</tr>
<tr>
<td>LHRRH</td>
<td>FSH (miu/ml)</td>
<td>P 11-2</td>
<td>17-8</td>
</tr>
<tr>
<td></td>
<td>C 7-6±2-1</td>
<td>13-9±3-4</td>
<td></td>
</tr>
<tr>
<td>Metoclopramide (10 mg)</td>
<td>TSH (μu/ml)</td>
<td>P 30-1</td>
<td>32-5</td>
</tr>
<tr>
<td></td>
<td>C 2-1±0-9</td>
<td>2-6±0-6</td>
<td></td>
</tr>
<tr>
<td>Metoclopramide</td>
<td>PRL (ng/ml)</td>
<td>P 34-8</td>
<td>82-7</td>
</tr>
<tr>
<td></td>
<td>C 8-5±1-4</td>
<td>19-4±4-03</td>
<td></td>
</tr>
<tr>
<td>TRH (200 μg)</td>
<td>TSHα (ng/ml)</td>
<td>P 4-8</td>
<td>15-0</td>
</tr>
<tr>
<td></td>
<td>C 0-5±2-0</td>
<td>0-5±2-0</td>
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<td></td>
<td>h 0-7±7-3</td>
<td>2-5±11-7</td>
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<tr>
<td>TRH</td>
<td>TSHβ (ng/ml)</td>
<td>P 1-0</td>
<td>1-5</td>
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<td></td>
<td>C 0-5</td>
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<td></td>
<td>h 0-5-9-3</td>
<td>2-6-15-5</td>
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</tbody>
</table>

*P = patient; †C = normal females; ‡h = hypothyroid females. For LH, FSH, TSH and PRL values for controls are mean ± s.e.m. For TSHα and TSHβ ranges are shown for both control groups. The subunit data has been obtained from Kourides et al., 1975.

after the last dose of dexamethasone, T3 levels had decreased to 1-84 nmol/l and basal TSH levels to 2-1 μu/ml. There was no change in T4. The peak TSH response to TRH was now within the normal range (Fig. 2). Basal PRL and the peak response to TRH was also normal (Fig. 2). In view of this dramatic response, the patient was subsequently given a trial of dexamethasone 0-5 mg every 12 hr for 1 month. During this period, tachycardia persisted and there was no change in thyroid hormone levels; in contrast to the response to high dose dexamethasone, there was also no effect on TSH, PRL, T4, and T3 concentrations. After 1 month, the patient developed severe epigastric pain and the trial was terminated.

T4 suppression test

Tri-iodothyronine (T3) was initially administered in a daily dose of 50 μg for 1 week. This was later increased to 100 μg daily for 2 weeks. During this period T3 levels increased to 9-22 nmol/l but there was no alteration in T4, PRL or basal TSH. There was however a reduction in the TSH response to TRH (Fig. 2). Nevertheless, considering the high dose of administered T3, and the elevated levels of endogenous hormone, these responses were still inappropriately high (Shenkman et al., 1973). During T3 therapy, the patient complained of a marked increase in the severity of her palpitations, as well as
excessive sweating. Her pulse was consistently over 120/min and her BMR was +28%. Because of the exacerbation of her symptomatology, the therapeutic trial was disbanded. On the last day of her T₃ administration, a repeat ¹³¹I uptake was 42% at 2 hr and 71% at 24 hr.

**Treatment with methimazole**

This was given on two occasions. The first trial consisted of a 3-week course. Ten milligrams were given daily for 1 week and subsequently 20 mg daily. There was a slight decrease in T₃ though levels were still above the normal range. No changes were observed in T₄. There was a marked increase in basal and TRH-induced TSH and PRL levels (Figs. 1, 2).

On a subsequent occasion, methimazole was given in a daily dose of 30–40 mg a day for 11 weeks. This produced an amelioration of her symptomatology with a reduction of T₄ and T₃ but increase in TSH levels. The administration of T₄ during methimazole administration was effective in reducing TSH levels to the pre-methimazole level (Fig. 1).

**Response to bromocriptine**

L-dopa and bromocriptine administered on a one-time basis produced a slight decrease in TSH (Fig. 3). An 11-month trial of bromocriptine was attempted together with propranolol (80 mg daily). The dose of bromocriptine was gradually increased from 7.5 mg daily to 30 mg daily. Twenty to 30 mg per day was given for 24 weeks. Galactorrhoea disappeared and there was also a marked decrease in basal and TRH-induced PRL levels (Fig. 2). TSH levels also decreased during bromocriptine. The mean of 17 samples was 13.1 ± 3.7 μU/ml and less (P<0.001) than values prior to bromocriptine. Nevertheless, these levels were still greater than in normals (P<0.001). There was no change in the TSH response to TRH (Fig. 2). T₄ levels fluctuated markedly and only one level was below 3.07 nmol/l. The mean of 19 samples during bromocriptine was 5.78 ± 1.25 nmol/l and not significantly different from pretreatment values. T₃ levels increased during bromocriptine. Mean of 27 samples was 286 ± 32.2 nmol/l as compared to 234 ± 45.0 nmol/l in the untreated period (P<0.001). Withholding propranolol for a few days was associated with return of tachycardia. After 11 months of therapy, the ¹³¹I uptake was 39% at 2 hr and 57% at 24 hr. In view of this lack of response, the therapeutic trial with bromocriptine was abandoned.

**Family studies**

Since inappropriate TSH secretion is frequently familial (Elewaut, Mussche and Vermeulen, 1976; Refetoff, Dewind and DeGroot, 1967; Rosler et al., 1982; Brooks et al., 1981), we examined the patient's mother and her six sisters. Her mother was asymptomatic, but had slight thyromegaly with a T₄ of 225 nmol/l and T₃ of 4.61 nmol/l. TSH levels were less than 1 μU/ml and there was an absent TSH response to TRH. She thus had the biochemical picture of classical hyperthyroidism. None of the patient's six sisters had any thyromegaly. All had normal thyroid hormone levels and a normal TSH response to TRH.

**Discussion**

This patient had elevated serum TSH in the presence of high circulating levels of thyroid hormones and thus has inappropriate TSH secretion (Condliffe and Weintraub, 1979; Gershengorn, 1981). Since the advent of the TSH radioimmunoassay, an increasing number of these patients have been recognized. The clinical and laboratory presentation of inappropriate TSH secretion is diverse. A classification of the potential causes of this syndrome has been proposed by Gershengorn and Weintraub (1975). Many of these subjects harbour a pituitary tumour (Baylis, 1976; Duello and Halmi, 1977; Waldhausl et al., 1979; Horn et al., 1976; Tolis et al., 1978; Smallridge, Wartofsky and Dimond, 1979). Their clinical and laboratory presentation has recently been reviewed (Gershengorn, 1981).

In our patient, there was no evidence of a tumour and polytomography of the sella and computerized tomography were normal. In a tumour, hyperthyroidism occurs in association with autonomous TSH secretion. In our patient, TSH rose predictably with TRH and methimazole, was partially suppressed by exogenous T₃, L-dopa and bromocriptine and fully suppressed by high dose dexamethasone. The high TSH thus responded qualitatively in a normal manner. In contrast, only one out of 19 cases with a TSH producing tumour showed an increase in TSH with TRH and one out of 10 a reduction with exogenous T₃ (Gershengorn, 1981). TSH suppression with dexamethasone as well as L-dopa and bromocriptine, however, has been documented in patients with TSH-producing tumour (Gershengorn, 1981; Horn et al., 1976; Smallridge et al., 1979).

The data on TSH subunits is also against the diagnosis of a tumour. In our patient, both TSH α and β subunits increased following TRH administration, as had been described in other non-tumour cases (Kourides et al., 1979). There is only one exception to this (Emerson and Utiger, 1972; Mihailovic et al., 1980). Tumours characteristically show no subunit response to TRH (Kourides et al., 1977; Smallridge et al., 1979; Kourides, 1981). In our patient, basal TSH α and β subunit levels were elevated, and equivalent to what is expected in
primary hypothyroidism (Kourides et al., 1975; Kourides et al., 1977). In 10 out of 12 patients with a tumour, TSH α subunit was markedly elevated as compared to that of TSH, whereas TSH β was suppressed (Kourides, 1981). The appropriately elevated TSH α and β subunits which respond qualitatively to stimulation is evidence against a tumour.

Non-tumoural patients with inappropriate TSH secretion form a very heterogeneous group with different clinical features encompassing the whole spectrum of thyroid disease. The variable clinical presentation may be related to the fact that the pathophysiological mechanisms causing the syndrome in non-tumour cases are diverse. In several cases, especially those with mild symptomatology, it has been suggested that the cause of the inappropriate TSH secretion is selective resistance to the action of thyroid hormones at the pituitary thyrotroph (Gershengorn, 1981; Kourides et al., 1977; Elewaut et al., 1976; Gershengorn and Weintraub, 1975; Novogroder et al., 1977; Sato et al., 1979).

In our patients, indices of peripheral tissue effects of thyroid hormones were increased. This included elevation of resting pulse and BMR. Sex hormone binding globulin, which is also an index of hyperthyroidism, was also increased (Staub, Conti and Huber, 1978). Serum cholesterol levels were reduced. Nevertheless, considering the markedly elevated levels of thyroid hormones, there was a discrepancy between the clinical and laboratory findings. This raised the question of thyroid hormone resistance at target organs. Indeed, patients with elevated TSH levels have been described who are clinically euthyroid or even hypothyroid, confirming the presence of pituitary as well as peripheral resistance (Refetoff et al., 1967; Brooks et al., 1981; Bode et al., 1973; Lamberg, 1973; Cooper et al., 1982; Linde et al., 1982; Kaplan et al., 1981).

Recently, a kindred has been described (Rosler et al., 1982) in which amelioration of both clinical and biochemical hyperthyroidism occurred on administration of T₄. In these patients, it was postulated that there was pituitary resistance to T₄ or, alternatively, that there was a defect in intracellular monodeiodination of T₄ to T₃. In these patients after 1 week of 75 µg T₃, TSH levels were suppressed as was the TSH response to TRH; T₄, T₃, and ¹³¹I uptake also reverted to normal. In contrast, after 3 weeks of T₃ treatment in our patient, no change in these parameters occurred except for the partial suppression of the TSH response to TRH.

In the majority of the cases of pituitary resistance to thyroid hormones, as well as in the kindred described above, TRH and antithyroid agents stimulate and T₄ suppresses TSH (Kourides et al., 1977; Elewaut et al., 1976; Rosler et al., 1982; Gershengorn and Weintraub, 1975; Novogroder et al., 1977; Sato et al., 1979). In one patient (Emerson and Utiger, 1972; Mihailovic et al., 1980) without demonstrable tumour, there was only slight suppression of TSH by thyroid hormone and no stimulation with TRH.

Other mechanisms for non-tumour inappropriate TSH secretion which have been proposed, but not proven, include ectopic production of TSH, or defects in TSH suppression secondary to abnormalities of dopamine or somatostatin (Gershengorn, 1981). Considering all the possible mechanisms of non-tumoural inappropriate TSH secretion, the most likely one operating in this subject is thyrotroph resistance to thyroid hormones.

Of interest in this patient was the presence of mild basal hyperprolactinaemia. Several patients with inappropriate TSH secretion have been described with hyperprolactinaemia, galactorrhoea and evenamenorrhoea (Rosler et al., 1982; Gershengorn and Weintraub, 1975; Baylis, 1976; Duello and Halmi, 1977; Horn et al., 1976; Benoit et al., 1980; Werner, 1979). Usually, these patients have an associated pituitary tumour, which often secretes TSH, as well as PRL (Baylis, 1976; Duello and Halmi, 1977; Horn et al., 1976; Benoit et al., 1980; Werner, 1979). However, in some patients, no tumour has been evident (Rosler et al., 1982; Gershengorn and Weintraub, 1975). Basal hyperprolactinaemia, as in the present case, is usually mild and decreases with bromocriptine and l-dopa (Horn et al., 1976; Werner, 1979). In our patient, PRL increased only minimally with TRH or metoclopramide. This has been observed previously in tumour cases (Baylis, 1976; Horn et al., 1976; Werner, 1979), although in situations without a tumour, exaggerated responses to TRH have been described (Rosler et al., 1982; Gershengorn and Weintraub, 1975; Sato et al., 1979).

Although thyroid hormones can inhibit PRL (Snyder et al., 1973), we and others observed no change in basal PRL levels nor PRL responses to TRH during T₄ therapy (Rosler et al., 1982; Gershengorn and Weintraub, 1975). On the other hand, high dose dexamethasone, l-dopa and bromocriptine did decrease PRL levels; and bromocriptine also blocked the PRL response to TRH. Thus, although the picture of basal hyperprolactinaemia with impaired response of PRL to TRH and metoclopramide is typical of a tumour, none could be demonstrated. It is conceivable that the thyroid hormone resistance operating at the thyrotroph in this patient also extends to the lactotroph (Gershengorn and Weintraub, 1975).

In view of the heterogeneity of the presentation of inappropriate TSH secretion, therapy can be complex. In cases with a tumour, primary therapy is directed at the pituitary. In euthyroid cases without a tumour, no treatment may be required. Indeed, antithyroid agents are contra-indicated. The judici-
ous use of thyroid hormones may be justified, especially when peripheral resistance is accompanied by signs of hypothyroidism (Gershengorn, 1981).

The main therapeutic difficulty is with non-tumour patients with peripheral manifestations of hyperthyroidism, such as in the present case. In this regard, it should be emphasized that there are no long-term follow-up studies and no controlled trials of different therapeutic approaches. In the present case, several treatment modalities are explored based on the neuroendocrine control of TSH secretion.

High-dose glucocorticoids are known to suppress basal and TRH-induced TSH secretion, as well as T₃, but do not produce changes in T₄ (Re et al., 1976). This was observed when 8 mg dexamethasone was given over 24 hr to our patient. However, on a maintenance dose of dexamethasone for 1 month, there was no clinical or laboratory effect. Because of the development of severe abdominal pain, the trial was abandoned.

TSH secretion is under dopamine control and dopamine, as well as bromocriptine, inhibits TSH secretion (Scanlon et al., 1980). In a patient with a TSH-producing tumour, L-dopa and bromocriptine-decreased TSH secretion in an acute experiment on a one time basis (Horn et al., 1976), although others have failed to confirm this (Waldhaeusl et al., 1979; Tolis et al., 1978; Benoit et al., 1980; Werner, 1979). Since these agents produced marginal TSH suppression in this patient, we carried out a long-term trial with bromocriptine. There was a dramatic effect on PRL suppression. Although TSH values decreased slightly, levels were still considerably greater than normal. There was, moreover, no effect on T₃ and T₄ increased. No change in ¹³¹I uptake occurred and after 11 months, the trial was terminated.

Mention has been made of the kindred who responded to T₃ administration (Rosler et al., 1982). When our patient received T₃, clinical symptomatology exacerbated. Somatostatin has been reported to decrease TSH levels in acute experiments in these patients (Reschini et al., 1976), but we did not use this agent.

Clinical improvement with reduction in thyroid hormone levels, occurred during propylthiouracil and methimazole therapy. However, this was accompanied by marked elevation of both TSH and PRL. After prolonged periods of thyroid deficiency, the pituitary of the mouse undergoes a progressive sequence of TSH cell hyperplasia, nodularity and then neoplastic change (Furth et al., 1973). This can be prevented by administration of thyroid hormones (Furth et al., 1955). The danger of propylthiouracil and methimazole in this patient is the potential for thyrotroph hyperplasia and hypertrophy, when there is prolonged inadequate thyroid hormone effect. Indeed, progression to neoplasm with pituitary en-

largement has been seen in chronic primary hypothyroidism (Vagenakis, Dole and Braverman, 1976; Samaan et al., 1977). In this patient, the hyperthyroidism was finally controlled with an ablative dose of ¹¹¹I. It is planned to add T₃ to the regimen in an attempt to decrease TSH and prevent thyrotroph stimulation.

In summary, this patient presented with decreased sensitivity of the thyrotrophs and lactotrophs to thyroid hormones. No pituitary tumour could be demonstrated. Since she had signs of hypothyroidism, resistance at the peripheral tissues was only partial. Even at the thyrotroph, resistance was incomplete since T₃, effected qualitatively normal, but quantitatively abnormal TSH inhibition.

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Hyperthyroidism due to inappropriate TSH secretion with associated hyperprolactinaemia--a case report and review of the literature.

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