back of thyroid hormones on pituitary TSH secretion. Thus basal ultrasensitive TSH level has become an important tool to detect hyperthyroidism, replacing the TRH-stimulation test.

The aim of our study was to determine whether chronic treatment with levodopa was able to lower the basal TSH levels, measured by an ultrasensitive assay, in Parkinsonian patients and thus be responsible for a false diagnosis of hyperthyroidism in such patients.

Thirty two Parkinsonian patients, mean (SD) age 73-12 (9-32) years; range: 50-88 treated with levodopa (187.5 mg/day to 700 mg/day, and up to 108 months of treatment) were studied. These patients were clinically euthyroid, had a normal clinical thyroid examination and normal levels of free T3. Blood samples were drawn at 8:00 am in fasting patients, from 8 to 12 hours after the last levodopa intake and the determination of free T3, free T4 and ultrasensitive TSH. These patients were not receiving any other drugs known to modify thyroid function. Thirty age matched controls with no history of thyroid disease were also studied, for comparison [mean (SD) 76-05 (9-31) years; range: 53-91]. Each patient and each control had titres of anti-thyroglobulin and anticrosoro antibodies less than 1/320 and 1/800 respectively (haemagglutination assay). Free T3 and free T4 were measured using radioimmunossay (RIA Amersham). Ultrasensitive TSH was measured by radioimmunoassay, using a monoclonal antibody (RIA Behring). The sensitivity of this TSH assay is 0.02 mU/l, the intra-assay and inter-assay coefficient of variations are 3.5% and 5% respectively. Comparisons of means were made with Student's unpaired t test after verification of a normal distribution for the data.

Free T3, mean (SD) 3-8 (1-29) pM/l; range: 1-3-57 and free T4, mean (SD) 13-4 (3-24) pM/l; range: 8-5-21] levels were not significantly different in Parkinsonian patients treated with levodopa than controls (table). The ultrasensitive TSH level was not significantly different in levodopa treated Parkinsonian patients [mean (SD) 1-71 (0-05) mU/l; range: 0-51-4] from controls [mean (SD) 1-45 (1-02) mU/l; range: 0-44-387] (table). Among the 32 patients, none had an ultrasensitive TSH level below the normal range. Ultrasensitive TSH level was not shown to be influenced by levodopa doses since no difference was noted between patients treated with less than 200 mg/day (n = 17) and those treated with more than 200 mg/day (n = 15) [1-64 (0-64) vs 1-97 (1-17) mU/l; not significant]. Furthermore, duration of levodopa therapy did not appear to modify ultrasensitive TSH level since no difference was observed between patients treated for less than 12 months (n = 12) and those treated for more than 12 months (n = 20) [1-53 (1-20) vs 1-82 (1-08) mU/l; not significant].

Clinical diagnosis of hyperthyroidism is often difficult in patients with Parkinson's disease because such tremor, weight loss and sweating are common to both diseases, because thyrotoxicosis only produces few symptoms in elderly patients, and because Parkinson's syndrome is not associated with hyperthyroidism in most cases. Thus hormonal evaluation of thyroid function appears to be very helpful, for diagnosis of hyperthyroidism, in Parkinsonian patients. Ultrasensitive TSH assay had been a great improvement over the basal level determination of free TSH and ultrasensitive TSH. These patients require a thyroid scintigraphy to detect hyperfunctioning nodules, allowing the diagnosis of hyperthyroidism. Before the ultrasensitive TSH assay was available, an absence of TSH response after TRH stimulation was the only method of detecting such hyperthyroid patients. As a decreased response of TSH after TRH had been reported in Parkinsonian patients treated with levodopa, it remains to be determined whether basal TSH levels, measured by ultrasensitive assay were modified by levodopa treatment. In our study, basal TSH levels, measured by an ultrasensitive in Parkinsonian patients treated with levodopa, were not found to be lower than in age matched controls. No patient treated with levodopa had an ultrasensitive TSH level below the normal range. Furthermore, in patients treated with levodopa, ultrasensitive TSH level was influenced neither by the levodopa dose nor by the duration of levodopa treatment.

In conclusion, chronic anti-Parkinsonian therapy with levodopa does not modify basal TSH levels measured by an ultrasensitive assay. Thus ultrasensitive TSH evaluation is as efficient a method to detect hyperthyroidism in patients treated with levodopa as in the general population.

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Levodopa treated (n = 32)</th>
<th>Controls (n = 30)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>73.1-9</td>
<td>76.0-9</td>
<td>0.27</td>
<td></td>
</tr>
<tr>
<td>Free T3 (pM/l)</td>
<td>3.3-8.3</td>
<td>3.80-7.29</td>
<td>0.20</td>
</tr>
<tr>
<td>Free T4 (pM/l)</td>
<td>8.26</td>
<td>13.40 (3.24)</td>
<td>0.47</td>
</tr>
<tr>
<td>Ultrasensitive TSH (mU/l)</td>
<td>0.17-1.5</td>
<td>1.71 (1.05)</td>
<td>0.38</td>
</tr>
</tbody>
</table>

Free T3, Free T4 and ultrasensitive TSH levels in levodopa treated Parkinsonian patients compared with age-matched controls, mean (SD): NS: not significant by Student's t test.

Vestibular and ventilatory dysfunction in sensory and autonomic neuropathy associated with primary Sjögren's syndrome

Subacute sensory neuropathy was described by Denny-Brown in association with carcinosarcoma and has recently been described in patients with primary Sjögren's syndrome (SS). The primary pathology is in the dorsal root ganglia and consists of lymphocytic infiltration and neuronal cell destruction. We describe a patient with levodopa induced sensory and autonomic neuropathy and the previously undescribed clinical features of vestibular and ventilatory dysfunction.

A 38 year old man presented with difficulty walking for one month and weight loss and tingling in the feet and hands, patchy areas of abnormal sensation on the trunk and perioral parasthesiae. He had experienced tremor and dryness of the eyes for several months before presentation. There were no other significant features. There was no weight loss, no evidence of renal or hepatic disease, no history of chronic alcohol consumption, no weight loss and no other significant clinical features. He had a history of Raynaud's phenomenon, with painless cyanosis of the fingers, with a positive family history of Raynaud's phenomenon. There was a family history of Raynaud's phenomenon, with painless cyanosis of the fingers, with a positive family history of Raynaud's phenomenon. There were no other significant clinical features. He had a history of Raynaud's phenomenon, with painless cyanosis of the fingers, with a positive family history of Raynaud's phenomenon.
nerves. A sural nerve biopsy showed axonal degeneration, with loss of large diameter fibres, and a sparse perivascular lymphoid infiltrate around occasional perineurial vessels. Biopsies of the lip and conjunctiva were normal. No evidence of malignancy was found. Autonomic function was tested using bedside techniques on six occasions. Initially the patient showed an abnormal heart rate response to the Valsalva manoeuvre, deep breathing and to standing. Later he also showed postural hypotension and reduction in the blood pressure response to hand grip.

Because of the xerophthalmia and xerostomia, and the finding of punctate keratitis on Rose–Bengal staining, a diagnosis of primary SS causing sensory and autonomic neuropathy was made. He was treated with intravenous methylprednisolone (500 mg per day for 5 days) and then given oral prednisone (100 mg/day). His gait improved and there was some improvement in joint position sense, although the numbness of the limbs and painful dysesthesiae persisted. After one month the steroid dose was tapered. When the prednisone dose was reduced to 80 mg/day he became worse and developed tight band-like sensations about the trunk. He developed dyspnoea and tachypnoea with resting respiratory rates up to 30 per minute. At this time he showed using signs of anxiety or emotional distress. Spirometry was normal and a chest radiograph was normal. Blood gas analysis showed a compensated respiratory alkalosis. Ten weeks after the first course, he was given a further course of 5 days of 500 mg/day of intravenous methylprednisolone and then continued on reducing doses of oral prednisone and he was treated with azathioprine (125 mg/day). Despite this, he then complained of blurred vision and intermittent oscillopsia. On examination, horizontal nystagmus was present for several weeks. Electronystagmography showed absent responses to caloric stimulation on two occasions. CT and MRI scans of the brain were normal. He was treated with both plasma exchange and intravenous gamma globulin and continued on prednisone and azathioprine for 8 months. At review 18 months after his first presentation, he continued to have severe ataxia of gait and widespread sensory loss with no remaining normal pain sensibility. His pattern of breathing had changed so that he no longer had tachypnoea, but had episodes when he noticed that he had ceased breathing. His wife noticed periods of apnoea lasting several minutes during sleep. A recording of respiration during sleep was performed on one occasion but apnoeic episodes were not observed.

Our patient had primary Sjögren's syndrome and had clinical and electrophysiological evidence of a subacute sensory neuropathy which has been well described in primary SS. He also had bilateral trigeminal sensory neuropathy and evidence of autonomic dysfunction which are also reported to occur in primary SS. There was no evidence of CNS disease, which is described in SS.

The new features in this patient are the vestibular and ventilatory abnormalities. The ventilatory problems consisted of dyspnoea and tachypnoea but later changed to intermittent apnoea. We propose that this may have been due to involvement of primary sensory neurons of pulmonary stretch receptors in the nodose ganglia by the neuropathic process. The pulmonary stretch receptors mediate the Hering-Breuer reflex which results in the termination of inspiration and the initiation of expiration. The initial dyspnoea and tachypnoea may have occurred as an irritative phenomenon while the later apnoea may have been due to neuronal loss. Similar involvement, in the nodose ganglion, of the primary sensory neurons of the carotid and aortic body chemoreceptors may also have contributed to the ventilatory disturbance. Slowing of respiration has been observed in rabbits with experimental allergic encephalomyelitis, where there is major pathology in the dorsal root ganglia, and has been attributed possibly to lesions in the nodose ganglia interrupting the Hering-Breuer reflex.

Our patient's oscillopsia may be due to a peripheral vestibular lesion as electroneystagmography showed absent caloric responses and there was no evidence of a central lesion on CT or MRI. We suggest that his vestibular dysfunction represents an extension of the pathological process to include the primary sensory neurons of the vestibular (Scarpa's) ganglia. Vestibular neuropathy has not previously been reported in subacute sensory neuropathy. In our patient, high dose corticosteroid treatment was beneficial, but the patient relapsed when the dose was reduced. Treatment with azathioprine, and intravenous gamma globulin were of no apparent benefit. After the end of treatment he remained stable. The clinical response of this patient suggests that benefit can be obtained by immunosuppressive treatment during the initial phase of inflammation.

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Dr P A McCombe is the holder of an NHMRC R. Douglas Wright New Investigator Award. Dr D McLaughlin is an NHMRC Postgraduate Medical Scholar.

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