patients underwent flush ligation of the long saphenous vein with the femoral vein and multiple avulsions of the varicosities. Patients returned six to eight weeks after the operation, when all measurements were repeated.

Statistical analysis was performed using Student's paired t test to compare the varicose and control legs and Kendall's rank correlation to compare leg aching with leg swelling.

Basal leg volume before the operation was significantly greater in the varicose legs (mean 4076 (SEM 90) ml) than in the control legs (3957 (91) ml) (t=3-58, p<0-01). Operation on the varicose veins reduced the basal volume of the varicose legs to 3969 (79) ml (t=5-3, df=25, p<0-001) (table). The venous reserve capacity of the varicose legs before the operation was not significantly different from that of the normal legs, but there was a significant increase after the operation, from 55 (4) ml to 70 (3) ml (t=3-9, p<0-01). There was a significant positive correlation between the severity of leg aching and the difference between the basal leg volume of the varicose and control legs before the operation (r=0-6, p<0-01). Twenty two patients (85%) reported a definite improvement in leg aching six weeks after surgery.

### Results of thyroid function tests before, during, and after oral administration of carbocisteine

<table>
<thead>
<tr>
<th>Day</th>
<th>0</th>
<th>3</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>60</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>Thyroxine (nmol/l)</td>
<td>70</td>
<td>58</td>
<td>50</td>
<td>55</td>
<td>55</td>
<td>80</td>
<td>75-135</td>
</tr>
<tr>
<td>Thyroid stimulating hormone (mU/l)</td>
<td>1-20</td>
<td>1-60</td>
<td>1-68</td>
<td>1-60</td>
<td>2-00</td>
<td>1-30-2-45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Triiodothyronine (nmol/l)</td>
<td>0-18</td>
<td>0-13</td>
<td>0-08</td>
<td>0-11</td>
<td>0-18</td>
<td>0-14-0-38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TSH (mU/l)</td>
<td>7-5</td>
<td>8-60</td>
<td>28-0</td>
<td>27-5</td>
<td>5-5</td>
<td>&lt;0-5-3-1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak after TRH (mU/l)</td>
<td>28-5</td>
<td>150</td>
<td>124</td>
<td>134</td>
<td>34-0</td>
<td>2-82-20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Comment**

It was originally believed that the antithyroid action of any compound could be expressed as a function of its reducing power and its preferential activity with iodine. This reducing theory, however, was unsatisfactory as it failed to explain the changes in the thyroidal hormones such as serum free thyroxine concentration and was therefore inadmissible. When the need for a more precise method of study of the thyroidal hormones was recognized, the antithyroid effect of these substances was found to be due to inhibition of iodine clearance by the thyroid.

1 Baramand KG, Doutson TF, Leach Thomas M, Browne NL. The relative importance of incompetent communicating veins in the production of varicose veins and varicose ulcers. Surgery 1979; 82:9-14.

(Accepted 28 April 1986)

**Antithyroid action of carbocisteine**

Cough mixtures that contain iodine are well known for their ability to induce goitre or hypothyroidism, or both, in susceptible patients.¹ We report a case of transient hypothyroidism apparently induced by a cough mixture containing carbocisteine (S-carboxymethylcysteine).

### Case report

A 47 year old housewife had undergone subtotal bilateral thyroidectomy two years previously because of toxic diffuse goitre. Postoperatively she remained clinically euthyroid and did not require thyroid treatment. Laboratory investigations showed mild triiodothyronine toxicosis: thyroxine concentration 125 nmol/l (9-7 μg/100 ml), free thyroxine index 128, and triiodothyronine concentration 2-85 nmol/l (1-9 μg/ml); thyroid stimulating hormone concentration was <0-5 μU/ml, with no response to 200 μg thyrotropin releasing hormone intravenously.

One year later she noticed weight gain, tiredness, and slight hoarseness. Physical examination was unremarkable. Thyroid function tests indicated mild hypothyroidism (thyroxine concentration 55 nmol/l (3-4 μg/100 ml), free thyroxine index 48, triiodothyronine concentration 1-45 nmol/l (0-9 μg/ml), and thyroid stimulating hormone concentration 2-5 μU/ml) increasing to 110 μU/ml after administration of thyrotropin releasing hormone). Thyroglobulin and microsomal autoantibodies in serum were positive. Uptake of radiodiode by the thyroid gland was normal. Acetoacetic acid test for ketosis was positive (discharge test yielded a positive result (discharge was 59%; upper limit of normal 20%). At this time she was taking a cough mixture (Mucodyne, Rhinathiol) containing 5 g carbocisteine/100 ml syrup; it did not contain iodine. The drug was stopped, and plasma thyroid hormone concentrations returned to normal (thyroxine 80 nmol/l (0-6 μg/100 ml), free thyroxine index 73, triiodothyronine 1-85 nmol/l (1-2 μg/ml)). Thyroid stimulating hormone remained slightly increased (12 μIU/l), and urinary iodine excretion was normal.

The drug was restarted with the patient's informed consent. The table shows the results of thyroid function tests. The drug did not decrease uptake of radiodiode by the thyroid, and the clinical state did not change. The symptoms improved when thyroxine was prescribed, and plasma thyroid stimulating hormone concentration became normal.

### Comment

It was originally believed that the antithyroid action of any compound could be expressed as a function of its reducing power and its preferential activity with iodine. This reducing theory, however, was unsatisfactory as it failed to explain the changes in the thyroidal hormones such as serum free thyroxine concentration and was therefore inadmissible. When the need for a more precise method of study of the thyroidal hormones was recognized, the antithyroid effect of these substances was found to be due to inhibition of iodine clearance by the thyroid.

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