Thyrotoxic crisis presenting as status epilepticus

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Summary: A 30 year old male patient with thyrotoxic crisis presenting as status epilepticus is reported. The aetiology, manifestations and management of this medical emergency are discussed. The importance of prompt, vigorous and comprehensive treatment of thyrotoxic crisis is emphasized. Rapid control of hyperthyroidism as well as other supportive measures are essential if the high fatality rate is to be reduced. Comprehensive management reduces mortality from 90% to 20%.

Introduction

Thyrotoxic crisis is an extreme state of hyperthyroidism and although uncommon, it is an exceedingly serious complication usually occurring in association with Graves' disease but rarely in conjunction with toxic multinodular goitre. It develops when a patient with untreated or incompletely controlled hyperthyroidism encounters a medical stress situation such as surgical or accidental trauma, or an intercurrent illness, often an infection. The clinical presentation and its severity is highly variable ranging from a febrile illness to hypotension, coma and death. Neuropsychiatric features are common and include tremor, anxiety, confusion, severe agitation, delirium and, if not treated, progression to stupor and coma may occur.

In this report we describe a young male patient with severe thyrotoxicosis presenting with status epilepticus who was treated successfully. So far as we are aware status epilepticus has not been previously reported as a complication of thyrotoxic crisis.

Case report

A 30 year old male patient was admitted as an emergency with status epilepticus. Three weeks previously hyperthyroidism had been diagnosed. Free thyroxine (FT4) was 83 pmol/l (normal range 8.8–22.3) and a free triiodothyronine (FT3) was 35 pmol/l (normal range 3–9) (Amersham PLC kits). Thyroid stimulating hormone (TSH) (Serono MIA clone kit) was less than 0.1 U/l (reference range 0.5–6.0 U/l). He was treated with propanolol 80 mg daily. Three days prior to admission he complained of severe frontal headache, vomited repeatedly and was noticed to be confused at times. On the morning of admission confusion had increased and he began to have generalized tonic/ clonic seizures. On arrival at hospital he was unconscious and in status epilepticus. The fits were not controlled with repeated intravenous diazepam injections and phenytoin but responded to chlorothiazole infusion at a titrated rate.

On examination his blood pressure was 170/70 mmHg, pulse rate 140 per minute, sinus rhythm, and temperature 38°C. A smooth soft small goitre was palpable with a prominent bruit. There were no signs of meningitis or congestive cardiac failure but clinically there were signs of infection at the base of the left lung. Routine haematological investigations, urea, electrolytes, liver function tests and calcium were all within normal range. Blood and urine cultures were negative but sputum culture grew *Streptococcus pneumoniae* and *Haemophilus influenzae*. Radiological examination of the chest showed inflammatory changes at the left base, skull X-ray and computed tomographic brain scan were normal and lumbar puncture revealed a normal cerebrospinal fluid.

The patient was intubated and ventilated as he was deeply unconscious with poor respiratory effort (P02 47 mmHg, 6.26 kPa). Treatment of thyrotoxic crisis was instituted with propylthiouracil 200 mg four hourly through naso-gastric tube together with Lugol’s iodine 10 drops 8 hourly. Propanolol was given initially 10 mg intravenously, then orally 80 mg three times daily. Supportive therapy included intravenous glucose and saline infusion, vitamin B complex and dexamethasone 12 mg/day. The chest infection was treated with intravenous antibiotics and physiotherapy whilst the pyrexia was treated with ice bags, cold air and aspirin.

He regained consciousness on the third day and was extubated 2 days later. Iodine treatment was
gradually withdrawn and he continued on maintenance therapy of propylthiouracil and propranolol. The results of thyroid function tests from diagnosis until the time of discharge are shown in Table I.

**Discussion**

Thyrotoxic crisis is an extreme state of hyperthyroidism, almost always precipitated by an intercurrent illness. Surgical and medical crises have been differentiated based upon the underlying aetiology. Surgery is said to result from manipulation of the thyroid gland leading to release of hormones into the blood stream, but as the condition can follow procedures not involving the thyroid it seems more likely that anaesthesia rather than surgery is responsible. In the past thyrotoxic crisis was most often observed postoperatively in patients poorly prepared for surgery but this is now a rarity due to adequate preoperative control of thyrotoxicosis. Medical crisis is more common; it occurs in untreated or inadequately treated patients and is precipitated by any major stress, most commonly severe infection. The physiological mechanism leading to thyroid crisis is not clear. It has been found that although the total thyroid hormone levels do not differ significantly between severe hyperthyroidism and thyroid storm, free thyroid hormone levels are usually much higher in the latter probably because of decreased affinity of thyroxine binding globulin for thyroxine. Occasionally the FT4 and FT3 measured by analogue assays are lowered rather than raised in thyrotoxic crisis because of the effect of severe illness.

In our patient the initial biochemical investigation revealed very high thyroid hormone levels and treatment with propranolol only was inadequate. With such high levels, propylthiouracil or carbimazole should have been commenced once the diagnosis was established and the patient should have been referred immediately for specialist consultation. Propranolol should have been used only as adjunctive therapy rather than sole therapy as it does not affect the underlying metabolic abnormalities significantly and is not effective in the prevention of thyroid storm.

The clinical picture of thyroid storm is variable but pyrexia is always present and may be extreme. A goitre is the rule and usually is smooth and accompanied by a bruit or thrill reflecting the underlying Graves' disease. Several neuropsychiatric manifestations have been described in this syndrome ranging from tremor to psychosis, delirium and coma. This patient presented in status epilepticus which has not been previously reported as a presentation of thyrotoxic crisis. On admission there were no other causes for the convulsions and the patient had no family or past history of epilepsy. We would suggest that the urgent measurement of thyroid hormone levels might be justifiable if the cause of convulsion in a patient is not apparent. All patients have a tachycardia and in the elderly cardiovascular manifestations may dominate the clinical picture. Epigastric pain with vomiting can develop early in the course of the disease as in this case. Severe diarrhoea is common and jaundice may be present.

Treatment of thyrotoxic crisis should begin as soon as the diagnosis is suspected on clinical grounds. It aims to correct both severe thyrotoxicosis and the precipitating illness and to provide general supportive therapy. Prevention of synthesis of new hormones is best achieved with propylthiouracil because it has the additional effect of inhibiting conversion of T4 and T3 in peripheral tissues. Iodine blocks thyroid hormone release as well as the organification of iodine. Reduction of peripheral T3 formation can be achieved with propylthiouracil and glucocorticoids. Large doses of dexamethasone inhibit hormone release, impair peripheral T3 formation and provide adrenal support. Combined therapy of uncomplicated hyperthyroidism with propylthiouracil, saturated potassium iodide and dexamethasone has been shown to restore the T3 level to normal within 24 hours. Several methods have been tried recently to lower high circulating thyroid hormones in severe cases including dialysis, plasmapheresis and haemoperfusion. Adrenergic antagonists are an important and perhaps crucial part of the therapeutic regime. Although they must be used

<table>
<thead>
<tr>
<th>Table I</th>
<th>Thyroid function tests from the time of diagnosis up to discharge from hospital</th>
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<tbody>
<tr>
<td><strong>Time</strong></td>
<td><strong>FT4 pmol/l (NR 8.8–22.3)</strong></td>
</tr>
<tr>
<td>On diagnosis</td>
<td>85.0</td>
</tr>
<tr>
<td>On hospital admission (3 weeks after diagnosis)</td>
<td>133.0</td>
</tr>
<tr>
<td>One day after admission</td>
<td>133.0</td>
</tr>
<tr>
<td>6 days after admission</td>
<td>24.1</td>
</tr>
<tr>
<td>12 days after admission</td>
<td>20.8</td>
</tr>
<tr>
<td>17 days after admission</td>
<td>15.1</td>
</tr>
</tbody>
</table>
cautiously when congestive cardiac failure is present, there is evidence of an overall benefit if the cardiac failure is treated concomitantly. Supportive therapy includes intravenous administration of glucose, saline, vitamin B complex for the hypercatabolic state and sedation as required. A vigorous attack on the hyperpyrexia should be made. In milder cases aspirin may suffice but more often fans or ice bags are required. If heart failure is present digitalis and diuretics are indicated. With the application of the therapeutic measures described above the mortality from thyrotoxic crisis has fallen from about 90% to 20%. The persistence of deaths from this complication calls for vigorous therapy when the diagnosis is suspected and for adequate control of hyperthyroidism.

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References
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