The Management of Severe Hyperthyroidism


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Either subtotal thyroidectomy or ablation of the gland with $^{131}$I will lead to a permanent cure of hyperthyroidism. In choosing between these 2 modalities of treatment, several factors should be taken into account, such as the type of goiter, the severity of hyperthyroidism, the size of the gland, age, fitness, and preference of the patient. It is our practice to perform a subtotal thyroidectomy on the young patient with a large gland and severe hyperthyroidism. In the preparation of these patients, thionamides, beta-blockade, and Lugol's iodine are used together until the patient is euthyroid. Preparation with beta-blockade alone led to the only instances of impending storm after surgery in our experience.

Before antithyroid drugs became available, thyroid storm was considered one of the most dreaded endocrine emergencies for which no satisfactory treatment was available beyond supportive measures. The incidence of storm was as high as 7% in hospitalized thyrotoxic patients [1] with a mortality rate of 60–70% [2, 3]. Since the use of iodine originally, antithyroid drugs since 1944, and of late, the addition of beta-blockade for preparation for ablation of the thyroid by either surgery or $^{131}$I, frank storm has become a rarity. However, impending storm in severe hyperthyroidism is still fairly common and the prodromal features should be recognized promptly. All manifestations of hyperthyroidism are exaggerated. There is increasing restlessness, hyperpyrexia with profuse sweating leading to dehydration, and pulse and respiratory rates that increase relentlessly.

More recently, “medical” storms have outnumbered “surgical” storms. The former are precipitated by some other form of trauma or acute intercurrent disease superimposed on hyperthyroidism.

Dental extractions, minor surgical procedures, or intercurrent infections are the most common precipitating events. Medical problems such as pneumonia, uncontrolled diabetes, cardiac decompensation, and pulmonary embolism have all been implicated [4]. In general, medical storm seems to mount in severity somewhat more slowly than surgical storm.

Atrial fibrillation and cardiac failure seen in patients with toxic nodular goiter (Plummer’s disease) and the profound exhaustion seen in the apathetic type of toxic nodular goiter can also present as a crisis which, if not treated promptly and vigorously, can lead to the death of the patient. Atrial fibrillation in the presence of toxic nodular goiter is usually resistant to treatment with digitalis.

Although eye signs and exophthalmos occur regularly in Graves’ disease, malignant exophthalmos is fortunately rare. The earliest symptoms and signs of this frightening complication are increased lacrimation, venous congestion, and chemosis. The course of the condition can be progressive, leading to increased intraorbital tension with threatened vision.

Some longstanding cases with severe hyperthyroidism can develop mild clinical jaundice. Sometimes hepatic dysfunction may be marked with associated hypoproteinemia. Many autopsied patients showed varying types and stages of hepatic necrosis [5]. Patients with severe thyrotoxicosis are extremely excitable, restless, hyperkinetic, emotionally unstable, and may develop frank psychosis.

Material

During a 10-year period, 177 patients (146 females and 31 males) with hyperthyroidism were referred to our institution for surgical treatment. Their mean age was 39.6 years. The reasons for referral included:

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1. Severe hyperthyroidism in young patients (under 40 years of age) with large glands (36%).
2. Failed medical treatment (18%).
3. Hyperthyroidism in patients with nodular goiter (36%). After assessment, 9 cases were referred for ablation of the gland with $^{131}$I and 8 cases were treated with thionamides.

One hundred sixty patients underwent subtotal thyroidectomy after preparation with carbimazole, propranolol, and Lugol’s iodine. Thirteen patients were prepared for surgery with beta-blockade alone.

**Results**

**Impending Surgical Storm**

Fortunately, this occurred in only 3 patients in our series and on all occasions in patients prepared for surgery with propranolol alone.

**Case 1.** A 24-year-old female presented with severe Graves’ disease with marked tremors, weight loss of 12 kg, and a sleeping pulse rate of 120 beats per minute. She had a large thyroid gland and exophthalmos (Werner class 3) [6]. Preparation for surgery was performed with 80 mg propranolol 3 times a day and 40 mg/day carbimazole in divided doses. However, when a skin rash developed, preparation was completed with propranolol alone. The operation was performed after 10 days when her sleeping pulse rate was 80 per minute. In the postoperative period she became restless, anxious, and started sweating profusely. She developed a pyrexia and the pulse rate increased to 140 beats per minute. Impending storm was diagnosed. Intravenous propranolol in a dose of 2 mg was administered by slow intravenous injection and repeated after 15 minutes. Intravenous fluids were administered. She responded rapidly with a decrease in pulse rate. Treatment was continued postoperatively with propranolol by mouth in a dose of 100 mg 8 hourly. Recovery was uneventful.

**Case 2.** A 36-year-old male presented with severe Graves’ disease with a large gland, exophthalmos (Werner class 3), sweating, palpitations, and a pulse rate of 120 per min. He was prepared for surgery with beta-blockade alone and received propranolol in a dose of 80 mg 8 hourly. He responded rapidly, with his sleeping pulse rate stabilizing at a rate of 85 per min., and was operated on after 2 weeks of preparation. A dose of propranolol was given with the anesthetic premedication and the next dose was administered as soon as he recovered from the anesthetic. Twelve hours after the operation, he became restless, anxious, hyperpyretic, and sweated profusely. His pulse rate increased to 150 per min. Impending storm was diagnosed and propranolol administered intravenously, as well as fluids and electrolytes. The response to the beta-blockade was inadequate and carbimazole (100 mg orally) was given, followed 1 hour later by 10 drops of Lugol’s iodine repeated 3 times a day. During the postoperative week he received 100 mg propranolol 3 times a day and 10 drops of Lugol’s iodine 3 times a day. He made a complete recovery.

**Medical Storm**

**Case 3.** A 64-year-old woman presented with a lump in the contralateral breast after mastectomy for carcinoma 3 years previously. During a search for bone metastases, it was noted that the thyroid concentrated the radioactive technetium. On examination, the thyroid was palpable but there were no signs of hyperthyroidism. Thyroid function tests were increased, however. She was “protected” with propranolol in a dosage of 40 mg 3 times a day before, during, and after the mastectomy which was uneventful. Propranolol was stopped on the 5th postoperative day. On the 7th postoperative day, she became restless, sweated profusely, and developed a tachycardia of 150. Pyrexia increased and she developed atrial fibrillation. The diagnosis of thyroid storm was made and the following treatment instituted: 2 mg propranolol intravenously, repeated after 15 minutes; 100 mg carbimazole by nasogastric tube; 1,000 mg hydrocortisone intravenously; 10 minims Lugol’s iodine by mouth; intravenous fluids; cold sponges and fans; oxygen and digitalis. She died within 3 hours.

**Malignant Exophthalmos**

Severe exophthalmos (Werner class 3) occurred in about 13% of our cases of Graves’ disease. However, malignant exophthalmos (Werner class 5 to 6) occurred only 3 times.

**Case 4.** A 36-year-old female presented with Graves’ disease. She had a large gland but the symptoms of hyperthyroidism were not severe. However, she developed severe endocrine ophthalmopathy with lacrimation, chemosis, edema, and muscle paralysis. Hyperthyroidism was controlled with 40 mg carbimazole per day in divided doses and 40 mg propranolol 6 hourly. Exogenous hormone was added to ensure euthyroidism. In spite of this treatment, the eye signs did not improve. Glucocorticoids were started. Prednisone (100 mg daily) was administered without dramatic response. It was only after injection of Depo-Medrol® into the