Clinics in Surgery

Case Report
Published: 15 Oct, 2020

Anesthetic Management for Resection of TSH - Secretory Pituitary Adenoma: A Case Report

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Abstract

Background: Thyroid-Stimulating Hormone (TSH) - secretory pituitary adenomas are a rare cause of hyperthyroidism. Nowadays, the treatment of choice is surgery. For that, patients must be euthyroid to avoid a possible thyrotoxic crisis during the surgery. We describe the following clinical case of a young woman who had transsphenoidal hypophysectomy for resection of TSH secretory pituitary macroadenoma.

Case: A 35-year old female arrives at the emergency department with palpitations, tachycardia, and tremor in her distal hands. She was diagnosed with hyperthyroidism of central origin secondary to a pituitary tumor. Her thyroid function was optimized during her admission to avoid a thyrotoxic crisis intraoperatively, and she was scheduled for transsphenoidal resection, which was successful. After the surgery, the patient was taken to the Intensive Care Unit (ICU). Due to her excellent evolution, the patient was sent to the neurosurgery ward for follow up and postsurgical treatment without any incidences 24 h after her surgery. Four days later, the patient was discharged home fully recovered.

Conclusion: TSH-secreting pituitary adenomas are a weird condition that requires a thorough and early diagnosis. Before surgery, adequate thyroid control will decrease the risk of a possible appearance of a thyroid storm, which can increase the mortality and morbidity of our patients.

Keywords: Pituitary adenoma; Hyperthyroidism; Thyroid storm; TSH; Anesthesia; Balanced; Transsphenoidal resection

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Received Date: *17 Sep 2020*
Accepted Date: *08 Oct 2020*
Published Date: *15 Oct 2020*

Citation:
Molero Díez YB, Álvarez AD, Dux RS. Anesthetic Management for Resection of TSH - Secretory Pituitary Adenoma: A Case Report. Clin Surg. 2020; 5: 2977.

Introduction

Thyroid-Stimulating Hormone (TSH) pituitary adenomas, also known as thyrotropinoma or TSHoma, are a rare cause of hyperthyroidism. Most of these tumors only secret TSH, but between 20% to 25% secret other hormones, of which Growth Hormone (GH) and Prolactin (PRL) are the most frequent. The diagnosis of this pathology may be delayed because symptoms are compatible with hyperthyroidism, so most patients receive treatment for Grave's disease, which is the most frequent type of hyperthyroidism. The treatment of choice is surgery. Therefore, patients must have an optimized thyroid function or euthyroid to avoid a possible thyroid crisis during surgery. We must be aware of these symptoms during the perioperative period and diagnose them in time because of their significant threat to life. We describe the following clinical case of a young woman who had transsphenoidal hypophysectomy for resection of TSH secretory pituitary macroadenoma.

Case Presentation

A 35-year-old woman arrived at the emergency department with palpitations, tachycardia, and tremor in distal hands. The patient had no relevant medical history except for factor XII deficiency with no symptoms. After laboratory results (TSH: 18.63 μU/mL (normal range: 0.27 μU/mL to 4.2 μU/mL); free T4: 4.37 ng/dL (normal range: 0.93 μU/mL to 1.71 μU/mL) and physical examination, the patient was admitted to endocrinology ward unit for early diagnoses of hyperthyroidism. A brain MRI was performed, and it showed a hypophysis macroadenoma. Together with the laboratory results, the endocrinologist diagnosed central hyperthyroidism with a TSH secreting pituitary adenoma. The patient was scheduled for transsphenoidal hypophysectomy. When the patient got to the operating room, standard monitorization was set with continuous ECG, oxygen saturation ($SatO_2$) by pulse oximetry, non-invasive blood pressure, and Heart Rate (HR). A warm blanket was put on the patient, and body temperature was monitored using a non-invasive central temperature

Spoton®. For checking the depth of anesthesia, the Bispectral Index (BIS®) was used. Once the patient monitored, we administered 3 mg of midazolam iv, and we performed preoxygenation to the patient for 3 min until O_2 end-tidal was greater than 90%; after, anesthetic induction was performed with a bolus of propofol 2 mg/kg, remifentanil 0.3 µg/kg/min and rocuronium 0.6 mg/kg. We used an endotracheal tube number 7.5 for intubation with no incidences with end-tidal CO_2 ($EtCO_2$) in range. For invasive blood pressure monitoring, the radial artery was canalized, and urinary catheterization was performed for hourly diuresis.

We set ventilatory parameters on FiO_2: 0.4 (air and 02 mixture), tidal volume 6 ml/kg with volume-control mode and respiratory frequency of 14 breaths per minute, and optimal PEEP of 5. Maintenance was established by Total Intravenous Anesthesia (TIVA) of propofol at 5 µg/kg/h and continuous perfusion of remifentanil at 0.10 µg/kg/min. The BIS® was maintained between 40 to 60 during the intervention. The patient remained hemodynamically stable in every moment with a stable heart rate and temperature maintained in 36.0°. For hydric balance, Isofundin® was administered at 120 ml/h. The ENT unit performed the endonasal endoscopic approach until they reached the tumoral zone, where the neurosurgery team performed the complete excision of the macroadenoma.

After the surgery, the patient was taken to the Intensive Care Unit (ICU) under the sedoanalgesia effects and connected to mechanical ventilation with continuous monitorization and postoperative control. When she was completely stable, sedation drugs were removed, and the patient was extubated during the first 4 h. Due to her excellent evolution, the patient was sent to the neurosurgery ward for follow up and postsurgical treatment without any incidences 24 h after her surgery. Four days later, the patient was discharged home fully recovered. After immunohistochemical analysis of the surgical piece, TSH-pituitary adenoma was diagnoses was confirmed. During follow-up, it was confirmed the normalization of thyroid hormones and no disturbance in the hypothalamic-hypophysis axis.

Discussion

TSHomas are the rarest kind of tumors among all the pituitary adenomas, representing only 0.5% to 2% of the total [1-3]. It is a benign tumor which only a few cases have turned into carcinoma in a limited number of patients. The first case of central hyperthyroidism caused by pituitary adenoma was reported in 1960. Until the last decade, not many cases have been reported; nevertheless, its incidence has increased since the appearance of new diagnostic methods. Its prevalence in the general population is about 1 to 2 per 1.000.000 [4]. Most of these tumors exclusively secret TSH; meanwhile, only 20% to 25% may secret another hypophysis hormone, which the most common are Growth Hormone (GH) or Prolactin (PRL) [5]. TSHoma can be diagnosed at any age, and no differences among sexes have been observed like it is in other thyroid pathologies [5]. These patients show elevated thyroid hormones (free T4 and circulating T3) together with normal or elevated TSH [6], revealing secondary or central hyperthyroidism.

The symptoms that these patients show are compatible with a hyperthyroidism clinical case (palpitations, tachycardia, tremor, weight loss, insomnia...); that is why most of them are initially treated as if they were suffering Graves's disease or primary hyperthyroidism [2]. Close to 80% of the new tumors are found when they are already macroadenomas because of the diagnostic delay. This percentage is decreasing because of the development of ultrasensitive methods for measuring TSH and improving the quality of hypophysis images in the MRI [4].

The treatment of choice is surgery in this kind of pituitary adenoma performing a hypophyseal adenomectomy with a transsphenoidal or subfrontal approach to eradicate the tumor and restore normal hypophysis functions [7]. Concerning the anesthetic management, in the preoperative period, these patients required the administration of beta-blockers together with antithyroid or somatostatin analogs, in order to maintain these patients with normal thyroid function and to avoid a potentially mortal thyrotoxic crisis. Beta-blockers are used for decreasing the symptoms caused by this thyrotoxicosis because of this increased beta-adrenergic activity. The use of these drugs is safe and effective for containing the symptoms of a thyrotoxic crisis perioperatively. During this perioperative period (intra and postoperative fundamentally), these patients must be monitored tightly. The appearance of a thyroid storm is a rare manifestation of hyperthyroidism, but it may happen during the surgery because this is a usual precipitating and stressing factor [8].

It is crucial to keep in mind this diagnosis because a thyroid storm is a life-threatening situation for the patient. Its treatment cannot wait for the confirmation of the diagnosis by thyroid hormone levels. The clinical management is symptomatic: We must give an intensive volume load (3000 ml/24 h to 500 ml/24 h) together with hemodynamic control with a single dose of esmolol 1 mg/iv to 2 mg/iv or propranolol 50 µg/kg/min to 200 µg/kg/min for diminishing the sympathetic response. It is recommended to administer hydrocortisone 100 mg/iv every 6 h to 8 h for avoiding the conversion of T4 to T3, plus antipyretic drugs and physical measures for cooling down and decreasing hyperthermia. If there were no clinical responses for these measures, plasmapheresis would be the last approach [9].

The possible complications that may appear, such as acute myocardial infarction, atrial fibrillation, hypoventilation with hypercapnia, and hydroelectrolytic imbalance, must be considered for its treatment [9]. Afterward, once the critical situation has passed, etiological treatment must start with first-line drugs like propylthiouracil: 500 mg/iv to 1000 mg/iv bolus followed by rectal 250 mg if the patient every 4 h if the patient is intubated. In conclusion, TSH-secreting pituitary adenomas are a weird condition that requires a thorough and early diagnosis. The adequate thyroid control with somatostatin analogs or antithyroid drugs, together with beta-blockers previously to the surgery, are going to decrease the risk of possible thyroid storm, which may increase the mortality and morbidity of our patients during the perioperative period.

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