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Case Report Open Access

Anesthetic management of a pregnant patient with uncontrolled hyperthyroidism for an emergency caesarean section: a case report

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Abstract

Background: Thyroid medications, beta-blockers, and dexamethasone are administered preoperatively to patients with uncontrolled hyperthyroidism undergoing emergency cesarean section under general anesthesia to inhibit peripheral conversion of T4 to T3 and control hyperthyroid symptoms.

Case presentation: A 20-year-old primigravida presented to the hospital at 37 weeks of gestation with symptoms of respiratory difficulty, tremors, excessive sweating, prominent eyes, palpitations, and anxiety-all indicative of untreated hyperthyroidism. The patient was urgently treated with an oral dose of propylthiouracil, Lugol's solution, a tablet of propranolol, an injection of dexamethasone, and an injection of pantoprazole intravenously. Given the severity of symptoms, a nasogastric tube was inserted to facilitate the administration of antithyroid medications. Arterial blood pressure cannula fixation and central venous cannulation are performed in the event a thyroid storm occurs that may require high-volume resuscitation. The patient was successfully treated under general anesthesia and monitored for thyroid storms in the postoperative period.

Discussion: In patients with poorly controlled hyperthyroidism, labor, delivery, or cesarean section can cause a life-threatening thyroid storm. In cases of thyroid storm, antithyroid drugs can be administered orally or rectally, so the Ryle tube was inserted before surgery. General anesthesia should be considered in patients with uncontrolled hyperthyroidism requiring emergency surgery, as it causes fewer fluctuations in hemodynamic parameters. Sympathetic stimulation should be avoided during the perioperative period. Regional anesthesia can be performed safely if there are no signs of heart failure. In the present case, there were no signs of heart failure, but the patient suffered from tachypnea. The decision was therefore made to proceed with general anesthesia, central venous catheterization, and invasive blood pressure monitoring.

Keywords: Caesarean section, Emergencies, General anaesthesia, Hyperthyroidism, Thyrotoxicosis

Introduction

Hyperthyroidism is an uncommon condition, occurring in only 0.2% of pregnancies.[1] However, uncontrolled hyperthyroidism during pregnancy can lead to serious complications such as pregnancy-induced hypertension, abortion, intrauterine growth restriction, low birth weight, stillbirth, maternal congestive heart failure, and thyroid storm.[2] As a result, uncontrolled hyperthyroidism during pregnancy is highly associated with morbidity and mortality in both the mother and fetus. Hypermetabolic changes associated with hyperthyroidism mimic many of the physiological changes of pregnancy. Therefore, it is crucial to carefully evaluate patients suspected of having thyroid disease during pregnancy.[3] If diagnosed with hyperthyroidism, it should be medically controlled to provide symptomatic relief for the patient and prevent the

occurrence of a thyroid storm. The presentation of patients with uncontrolled hyperthyroidism during pregnancy is uncommon. Therefore, we are presenting a rare case of successful anesthetic management of an uncontrolled hyperthyroid patient who underwent an emergency cesarean section under general anesthesia.

Case presentation

A 20-year-old primigravida patient presented to the hospital at 6 months of gestational age with symptoms including excessive sweating, anxiety, and prominent eyes. Diagnostic tests revealed hyperthyroidism with the following thyroid function tests: T3 2.18 (normal range 0.92-2.5 nmolL-1), T4 188.25 (normal range 60-120 nmolL-1), and TSH <0.05 (normal range 0.35-5.5 μIUml-1). The patient was prescribed 150mg TID (three times a day) of propylthiouracil through oral tablets. She continued receiving treatment for two months before abruptly discontinuing medication. However, at 37 weeks of gestation, the patient presented once again to the hospital with a number of distressing symptoms, including respiratory difficulty, tremors, excessive sweating, prominent eyes, palpitations, and anxiety.

During the examination, the patient was found to be conscious and fully oriented to person, place, and time. Her heart rate was recorded at a high of 132 beats per minute, blood pressure at 170/100 mmHg, temperature at 37 ºC, and respiratory rate at 32 per minute. Notably, the patient had moist skin, proptosis, and lid lag. Cardiovascular and respiratory system examinations were largely unremarkable, with the exception of sinus tachycardia and tachypnea. The patient's tendon reflexes were brisk, and while her thyroid gland was not enlarged, an airway examination revealed an adequate mouth opening with a Mallampatti grade II.

The patient's routine investigations returned with all measurements within normal ranges, with the exception of her thyroid profile, which displayed T3 levels at 1.35 nmolL-1, T4 at 146.15 nmolL-1, and TSH at <0.05 μIUml-1. An electrocardiogram was performed, showing sinus tachycardia with a heart rate of 130 bpm. However, on a non-stress test, the fetal status appeared to be minimally reassuring, with minimal variability of heart rate. As a result of this concerning finding, an emergency caesarean section was planned.

Prior to surgery, the patient was administered several medications, including 150 mg of propylthiouracil orally, three drops of Lugol's solution orally, 40 mg of propranolol tablets, 2 mg of dexamethasone injections, and 40 mg of pantoprazole injections intravenously. A nasogastric tube was also inserted to facilitate further administration of antithyroid medications.

Prior to surgery and anesthesia, informed consent was procured from the patient, and all parties involved confirmed the consent in writing. Following this, the patient was moved onto the operation table, the left uterine was displaced, and standard American Society of Anaesthesiology monitoring was initiated. This included an electrocardiogram, a pulse oximeter, non-invasive blood pressure, a temperature probe, and capnography. The patient's vitals were recorded at HR 110 per minute, BP 150/90 mmHg, and a core temperature of 37 ºC. A peripheral intravenous catheter of 18G was secured to facilitate intravenous access, and an arterial blood pressure cannula was secured under all aseptic precautions. Continuous blood pressure monitoring was subsequently initiated. As a preventative measure, central venous cannulation was performed in the right internal jugular vein in case a thyroid storm occurred, thus enabling large-volume resuscitation. Additionally, to ensure prompt and effective medical intervention in case of an emergency, cold saline, a defibrillator, and other essential resuscitation measures were readily available on the operation table.

To ensure adequate oxygenation, preoxygenation was carried out for a total of three minutes before proceeding to rapid sequence induction. In order to induce anesthesia, an intravenous injection of thiopentone 250 mg and succinylcholine 75 mg was administered. Subsequently, endotracheal intubation was successfully executed through direct laryngoscopy using an endotracheal tube that measured 6.5 mm in internal diameter. To continuously monitor the patient's temperature in the nasopharynx, monitoring was initiated after anesthesia induction. Following the delivery of the baby, a 100-μg injection of fentanyl was administered to the patient. Once the effect of succinylcholine had ceased, an injection of atracurium 25 mg was given. The interval between

anesthesia induction and the delivery of the baby was approximately 4 minutes. A male baby weighing 2.7 kg was delivered, with an Apgar score of 6 and 9 at 1- and 5-minutes following delivery. To prevent postpartum hemorrhage, a total of 10 units of oxytocin were given via infusion. Throughout the entire intraoperative period, the patient's vitals remained stable. Blood loss was estimated at approximately 500 ml, and to compensate for fluid loss, a total of 2500 ml of ringer lactate was administered. Upon completion of the surgery, the patient was extubated and closely monitored for signs of thyrotoxicosis in the post-operative period at the high dependency unit.

Following surgery, the patient was given 150 mg TDS of propylthiouracil, three drops of Lugol's solution TDS, 40 mg TDS of propranolol, and 6 mg of dexamethasone daily. On the third postoperative day, the medication was gradually tapered. Fortunately, the entire postoperative period remained uneventful, and the patient was safely discharged on the fifth postoperative day. Upon birth, the baby's cry was hoarse, and this prompted a cord serum test that revealed normal T4 and T3 levels but decreased TSH. The baby was therefore monitored in the neonatal intensive care unit for two days, and the rest of their hospital stay was uneventful. Follow-up appointments were made for the baby to check for hypothyroidism or hyperthyroidism on an outpatient basis.

Ethical considerations

In terms of ethical considerations, it's worth noting that the participant did sign an informed consent form prior to taking part in the study. In this particular case, being a clinical case report, institutional ethical approval wasn't necessary.

Discussion

During pregnancy, uncontrolled hyperthyroidism is a rather uncommon occurrence. A few possible differential diagnoses for hyperthyroidism during pregnancy include Grave's disease, gestational thyrotoxicosis, single toxic nodule, toxic multinodular goitre, subacute thyroiditis, or silent thyroiditis, to name a few.[3] It's worth noting that the most common cause of hyperthyroidism is Grave's disease, an autoimmune condition caused by IgG-type autoantibodies. While these autoantibodies can cross the placenta and lead to neonatal Grave's disease, one important thing to note is that the condition is typically self-limiting.[4] It's important to note that in patients with poorly controlled hyperthyroidism, labor, delivery, or a caesarean section can potentially trigger a life-threatening thyroid storm.[5] Furthermore, anxiety and agitation related to anesthesia and analgesia can have a similar effect.[6] These dangerous episodes are characterized by symptoms such as tachycardia, hyperpyrexia, and changes in level of consciousness, and it's crucial to identify them early on as untreated cases can rapidly deteriorate.[7,8] If a thyroid storm is detected, antithyroid drugs can be administered orally or rectally, which was the case for the patient in this particular situation who had a Ryle's tube inserted preoperatively.[9] It's worth noting that there have been cases of thyroid storm occurring before induction of anesthesia, and in some of these cases, intravenous methimazole was used as treatment.[6,10]

Hyperthyroidism can present a variety of symptoms, including anxiety, hyperhidrosis, heat intolerance, fatigue, muscle weakness, weight loss, tachycardia, palpitations, dyspnea, increased appetite, exophthalmos, leg swelling, goiter, cold clammy skin, tremor, thyroid bruit, and atrial fibrillation (which is typically seen in elderly individuals).[11] Dyspnea is frequently induced by causes such as decreased lung compliance, decreased vital capacity, increased minute ventilation, and poor respiratory muscle activity in hyperthyroidism. Additionally, the sensitivity of respiratory centers to hypoxia and hypercapnia is typically heightened. If an individual with hyperthyroidism has a large goiter, it may compress the trachea and lead to respiratory distress.[12] In the case at hand, tachypnea was present in the patient, which may be attributed to some of these underlying reasons.

Propylthiouracil is typically the preferred treatment option for thyroid storm, as it can inhibit the peripheral conversion of T4 to T3.[13] Both methimazole and propylthiouracil can also inhibit the synthesis of thyroid hormones, but it's important to note that methimazole should not be administered in the first trimester of pregnancy due to an increased risk of birth defects. Additionally, both drugs can cross the placenta and may cause goiter or hypothyroidism in newborns.[10,13] Beta

blockers are another commonly used treatment to manage hypermetabolic symptoms and inhibit peripheral conversion of T4 to T3. However, prolonged use of beta blockers during pregnancy can lead to complications such as intrauterine growth retardation, a small placenta, post-natal bradycardia, hypoglycemia, and a decreased response to hypoxic stress.[1] Esmolol is a short-acting, water-soluble beta-1 adrenergic blocker that can be administered just before delivery to minimize the risk of neonatal side effects.[14] Furthermore, Lugol's solution can inhibit the release of stored thyroid hormones from thyroid follicles. It's worth noting that prolonged use of iodine therapy during pregnancy can cause goiter in the fetus, so it should be used for a very brief period, if at all.[5] Dexamethasone is another drug that can inhibit the peripheral conversion of T4 to T3.[13] When administering antithyroid drugs, it's important to use the lowest effective dose possible, and the dose should be tapered once the desired response has been achieved. Additionally, treatment should be continuously monitored, with free T4 and TSH levels checked every 2-4 weeks at the outset and later every 4-6 weeks.[3] In the present case, the patient had stopped taking propylthiouracil 15 days before being admitted to the hospital and was displaying signs of uncontrolled hyperthyroidism, putting her at high risk of developing a thyroid storm during the perioperative period. As a result, propylthiouracil, Lugol's solution, and dexamethasone were administered before the operation to prevent peripheral conversion of T4 to T3 and inhibit the release of stored thyroid hormones from thyroid follicles. Additionally, propranolol was given before the operation to control tachycardia and prevent peripheral conversion of T4 to T3. These treatments were also continued in the postoperative period to prevent thyroid storms and manage the symptoms of hyperthyroidism, with gradual tapering over time.

For patients with uncontrolled hyperthyroidism requiring emergency surgery, it's usually wise to consider general anesthesia. This approach comes with less fluctuation in hemodynamic parameters, and the patient is sedated, reducing any sympathetic stimulation in the perioperative period.[6] To achieve this, propofol and ramifentanyl are commonly used drugs that can lower heart rate and blood pressure.[7] An arterial catheter was inserted to ensure continuous blood pressure monitoring, while a central venous line was secured as a precaution in case of a thyroid storm, which can necessitate large-volume resuscitation in these patients.[8,13] If there are no signs of cardiac failure, regional anesthesia is usually a safe option during surgery.[15] In the present case, while there were no indications of cardiac failure, the patient had tachypnea. Therefore, the decision was made to proceed with general anesthesia with central venous catheterization and invasive blood pressure monitoring.

Conclusions

Uncontrolled hyperthyroidism during pregnancy carries a high risk of morbidity and mortality, both for the mother and the fetus. Preoperative administration of antithyroid agents, beta blockers, and dexamethasone to inhibit peripheral conversion of T4 to T3 and control hyperthyroid symptoms can result in successful anesthetic management of uncontrolled hyperthyroid patients undergoing emergency caesarean sections under general anesthesia. Women with poorly controlled hyperthyroidism are at risk of experiencing a life-threatening thyroid storm during labor, delivery, or a caesarean section. Therefore, it's essential to have early detection and adequate resources prepared for the management of thyroid storms to avoid rapid deterioration in these patients.

Acknowledgment

None.

Competing interests

The authors declare that they have no competing interests.

Abbreviations

Beats per minute: bpm; Blood pressure: BP; Heart rate: HR; Three times a day: TID; Triiodothyronine: T3; Thyroxine: T4; Thyroid stimulating hormone: TSH.

Authors' contributions

All authors read and approved the final manuscript. All authors take responsibility for the integrity of the data and the accuracy of the data analysis.

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Availability of data and materials

The data used in this study are available from the corresponding author on request.

Ethics approval and consent to participate

The clinical case report did not interfere with the process of diagnosis and treatment of patient and the patient signed an informed consent form.

Consent for publication

By submitting this document, the authors declare their consent for the final accepted version of the manuscript to be considered for publication.

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