

TOP 10 FACTS

10 Facts You Need to Know About the Anesthetic Management of the Pregnant Patient with Graves' Disease

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Graves' disease and gestational thyrotoxicosis are the predominant causes of hyperthyroidism in pregnancy. The pregnant patient with Graves' disease will require medical treatment and may require thyroidectomy. In addition, the pregnant patient with Graves' disease will usually progress to delivery. In the pregnant patient with Graves' disease, the most important anesthetic considerations include: timing and anesthetic management of urgent or emergent thyroidectomy, type of anesthesia for delivery, assessment of medication compliance, recognition and management of a difficult airway, recognition and management of thyroid storm, and considerations for malignant hyperthermia as an alternative diagnosis to thyroid storm in a pregnant patient exposed to volatile anesthetics and/or succinylcholine.

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1. Increased placental human chorionic gonadotrophin (hCG) secretion in pregnancy alters normal thyroid physiology and may cause gestational thyrotoxicosis.

Because placental hCG shares structural features with thyroid stimulating hormone (TSH), it is able to bind TSH receptors and stimulate increased production and secretion of thyroid hormone.¹ This increase may result in gestational thyrotoxicosis during the first trimester.² Gestational thyrotoxicosis is associated with hyperemesis gravidarum, which occurs when severe nausea and vomiting in the first weeks of pregnancy causes significant

weight loss, dehydration, and electrolyte abnormalities.³ Outside of treating dehydration, nausea and vomiting, and sympathetic symptoms, gestational thyrotoxicosis requires no intervention on the thyroid gland itself.³

2. Thyrotoxicosis from Graves' disease in the pregnant patient requires treatment with antithyroid medications.

Untreated hyperthyroidism in pregnancy is associated with pregnancy loss, low birth weight, preeclampsia, maternal heart failure, maternal pulmonary hypertension and thyroid storm.⁴⁻⁶ Graves' disease requires treatment with antithyroid drugs, especially in the first trimester. However, mild hyperthyroidism from Graves' disease may improve enough by the third trimester that antithyroid medications can be discontinued.⁷

3. Propylthiouracyl is the preferred antithyroid medication for hyperthyroidism during pregnancy.

The mainstays of treatment for hyperthyroidism in pregnancy are antithyroid drugs called thioamides, which decrease thyroid hormone synthesis and release.⁸ Methimazole (MMI), carbimazole (CM), and propylthiouracyl (PTU) are the most commonly used antithyroid drugs in pregnancy. PTU is generally preferred in pregnant patients in the first trimester, because MMI has been associated with MMI embryonopathy (i.e. developmental abnormalities related to maternal drug exposure).⁸ In addition, PTU is preferred for thyroid storm because it also inhibits intracellular conversion of T₄ to the biologically active T₃.⁹ However, PTU has been reported to be a significant cause of drug-induced liver failure requiring liver transplantation.¹⁰

4. Thyroidectomy may result in spontaneous abortion in the first trimester and premature labor in the second and third trimester^{11,12}.

A pregnant patient that must undergo thyroidectomy for medical reasons must not be denied surgery regardless of trimester.¹³ However, the second trimester may be the best time for urgent or emergent non-obstetric surgery in the pregnancy patient relative to the first and third trimesters as it relates to prevention of premature labor and spontaneous abortion.^{14,15}

5. The preoperative examination of the pregnant patient with Graves' disease should focus on medication compliance, mental status, airway exam, and cardiovascular status.

Graves' disease should be suspected in the presence of Merseburg triad: palpitations, goiter, and exophthalmos.¹⁶ Goiters that are large enough to cause shortness of breath, dysphagia, compression of the recurrent laryngeal nerve, or superior vena cava syndrome may cause difficulty with airway management. Altered mental status and atrial arrhythmias suggest uncontrolled hyperthyroidism, which should always raise concern for the potential triggering of thyroid storm in the perioperative period.

6. Neuraxial techniques are the preferred anesthetic choice for the pregnant patient with Grave's disease unless there is clinical evidence of thyroid storm.

Neuraxial techniques offer the benefit of blocking the sympathetic response during labor and delivery without airway instrumentation or sedation. This blocking makes neuraxial techniques the preferred method in pregnant patients with hyperthyroidism that need analgesia and anesthesia for both vaginal and operative delivery. However, there is little evidence to support neuraxial anesthesia over general anesthesia for cesarean delivery in pregnant patients with hyperthyroidism.¹⁷ Although there is a theoretical concern for epidural solutions containing epinephrine, there is little evidence that these solutions exacerbate hyperadrenergic symptoms even in patients with poorly managed hyperthyroidism.¹⁸

7. General anesthesia is the anesthetic of choice in the pregnant patient with thyroid storm.

Thyroid storm is a medical emergency that may result in cardiovascular collapse, seizures, and liver failure.¹⁹ As a result, tight control of the airway, breathing, and circulation is warranted. Medications that stimulate sympathetic activity (i.e. ketamine, atropine, glycopyrrolate, beta agonists) are best avoided.

8. Thyroid storm is rare in pregnancy but can occur any time in the perioperative period.

Thyroid storm is a medical emergency that can be precipitated by many things, including noncompliance with antithyroid medication, infection, diabetic ketoacidosis, trauma, surgery, normal labor, preeclampsia, and hemorrhage.^{4,20,21}

9. The management of thyroid storm is focused on immediately decreasing thyroid hormone production and secretion, decreasing peripheral conversion of T₄ to T₃, and supportive cooling and hydration measures.⁴

Table 1. Pharmacologic management of Thyroid Storm

Drug	Function	Comments	Dosing
Propylthiouracil	Decreases thyroid hormone production and synthesis; decrease T4 to T3 conversion	Liver failure; preferred over MMI for thyroid storm	300 mg PO Q6H
Methimazole	Decreases thyroid hormone production and synthesis	Embryonopathy; maternal Agranulocytosis	30 mg PO Q6H
Sodium Iodide	Block thyroid hormone release	Given 1 hour after PTU is given	1 g IV Q12H
Propranolol	Control hyper-adrenergic activity; decrease T4 to T3 conversion	May worsen heart failure	60-80 mg Q4H
Esmolol	Control hyper-adrenergic activity	May be preferred if beta blockade worsens heart failure	50 mcg/kg/min IV
Hydrocortisone	Treat relative adrenal insufficiency; decrease T4 to T3 conversion		100 mg IV Q8H
Tylenol	Decrease fever	Does not increase free thyroid hormone like aspirin	1 g IV or PO Q6H
Cholestyramine	GI removal of thyroid hormone		4 g PO Q12H

The mortality rate of thyroid storm may be as high as 25%, especially when congestive heart failure is involved.^{21,22} For patients not responsive to conservative measures and antithyroid production and releasing measures, plasmapheresis may be indicated.^{23,24} Cholestyramine may also be used to reduce levels of thyroid hormone during thyroid storm.²⁵ Regardless of patient status, any patient with thyroid storm should be managed in the intensive care unit. If a source of infection is suspected, broad spectrum antibiotics should be given without delay. The pharmacologic management of thyroid storm is presented in [Table 1](#).

10. Thyroid storm may be confused with malignant hyperthermia in a patient that has received a general anesthetic using a halogenated anesthetic and/or muscle relaxation with succinylcholine.

Malignant hyperthermia is a metabolic condition with high mortality if left untreated that presents similarly to thyroid storm. However, hypercarbia and hyperthermia will be more pronounced, and rigidity will be present.²⁶ If the diagnosis of thyroid storm is in question during general anesthesia in the pregnant patient, dantrolene should be considered for malignant hyperthermia.¹⁹

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