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Thyroid Storm
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Introduction
Thyroid Storm is an extreme hyperthyroidism that is an endocrine emergency with a mortality rate of 20-30% (Javert, 2013). This condition is a rare diagnosis that occurs in 0.2 persons out of 100,000 population/year according to recent manuscripts (Beuzit, GuzzeQ, De Martin, Lasban, & Cuffari, 2017). Thyroid Storm is more common in women 30-40 years of age and are female more than male (Schreiber, 2017). In the United States, the incidence of thyroid storm is more frequently seen in Caucasians and Hispanics than in African Americans (Schreiber, 2017). While the disease occurs mainly in those with pre-existing hyperthyroidism, it can also occur in those without it (Schreiber, 2017).

Pathophysiologic Process

Underlying Process
Normal thyroid hormone physiology is maintained by feedback mechanisms between the hypothalamus, anterior pituitary and thyroid gland. In Thyroid Storm, the physiology of the disruption in function is not well understood. The disorder has been closely linked to a known diagnosis of Graves disease and toxic multinodular goiter, although it can occur without these diagnoses (Ross, Burch, Cooper, Greene, Leibman, & Walter, 2016). Graves disease is an autoimmune disease where autoantibodies affect TSH stimulation, resulting in excessive production of T3 and T4 (Ross, Burch, Cooper, Greene, Leibman, & Walter, 2016). Likewise, in Thyroid Storm, there is an increase response to thyroid hormone and an increased or abrupt availability of free hormones and enhanced binding to thyroid hormone receptors. Similar to Graves Disease, there is an increase in T4 and T3, but not in the levels as in uncomplicated hyperthyroidism (Chha, Samarsinghe & Kabaker, 2015). This has been found to have higher levels of free thyroxine (FT4) and free triiodothyronine (FT3) and decreased levels of total T4 and T3 (Chha, Samarsinghe & Kabaker, 2015). This could be because of a reduction in carrier proteins and an increase in free hormone levels due to free hormone binding capacity with various stimuli (Chha, Samarsinghe & Kabaker, 2015).

The rapid increase in free hormone levels may also be a contributor to the body’s physiologic response during Thyroid Storm. There also could be an adverse effect that contributes to Thyroid Storm. There is an enhanced responsiveness to endogenous catecholamines related to an increase in tissue specific beta-adrenergic receptor density or modification in post-receptor signal pathways (Chha, Samarsinghe & Kabaker, 2015). There has been shown to amplify the trans-scriptional response to nonphosphorylated in human adipose tissue, which is where these responses occur (Chha, Samarsinghe & Kabaker, 2015). The level of cyclic adenosine monophosphate is increased and the increase binding of beta-adrenergic receptors, which is why propranolol is an appropriate treatment in Thyroid Storm (Chha, Samarsinghe & Kabaker, 2015).

Thyroid System

Thyroid hormone and T3 and T4
Increased metabolism
Increased heart rate, tachycardia
Increased cardiac output
Intra-operative and close monitoring post-operatively

Signs and Symptoms

• Extreme anxiety
• Fever
• Tachycardia
• Cardiovascular instability including arrhythmias
• Vomiting
• Altered mental status (Javert, 2013)

Intraoperatively, signs and symptoms could be masked by anesthetics (Javert, 2015). Most commonly diagnosed post-operatively or not at all.

There is no universally accepted criteria to diagnose but the Burch-Wartofsky Point Scale (BWPS) can be helpful to assess severity and guide treatment, shown above (J, 2017).

Pathophysiologic Process continued

Significance
Thyroid hormones influence every tissue and organ system. When increased, there is an increase in thermogenesis and basal metabolic rate, decreased serum cholesterol levels and decreased SHV occurs. If left untreated, Thyroid Storm can lead to weight loss, osteoporosis, atrial fibrillation, embolic events, muscle weakness, tremor, neuropsychiatric symptoms, cardiovascular collapse and death related to high output heart failure (Ross, Burch, Cooper, Greene, Leibman, & Walter, 2016).ing conditions could be drugs such as amiodarone, sotalol, quinidine, inappropriate hormone ingestion, radioactive therapy and exposure to excessive iodide (Beuzit, GuzzeQ, De Martin, Lasban, & Cuffari, 2017). Thyroid storm is more common in women 30-40 years of age and are female more than male (Schreiber, 2017). In the United States, the incidence of thyroid storm is more frequently seen in Caucasians and Hispanics than in African Americans (Schreiber, 2017). Thyroid storm occurs mainly in those with pre-existing hyperthyroidism, it can also occur in those without it (Schreiber, 2017).

Implementations for Nursing Care

• Perioperative screening for thyrotoxicosis
• Cardiac monitoring
• Waiting 6-8 hours for anti-thyroid drugs to become effective prior to elective cases
• Frequent lab monitoring
• Frequent mental status screening post-operatively

Conclusion
Thyroid storm is an endocrine emergency that requires a rapid response. Prevention measures include careful pre operative screening, watching closely for the signs and symptoms intraoperative and close monitoring post-operative. If left untreated, Thyroid Storm could lead to mortality or significant morbidity such as brain injury, cerebrovascular disease, muscle atrophy, renal impairment and long-term sequelae (Chha, Samarsinghe & Kabaker, 2015).

References

Topic Importance
As a future Nurse Anesthetist (CNA), knowledge of this emergency endocrine topic will be vital for application throughout all specialties of patients. Thyroid Storm can occur intraoperatively and as a post-operative complication that can occur to mortality. Knowledge of the disease process, signs and symptoms and early treatment are necessary to prevent the associated mortalities with this disease.

Risk Factors:
• Older age
• Cardiovascular complications
• Congestive heart disease
• Pulmonary disease
• Renal failure
• Infection
• Trauma
• Poorly controlled diabetes
• Existing Graves’ disease or Toxic multinodular goiter