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Impending tyroid storm

Pretika Prameswari[1], Mohamad Fadli[2]
[1,2] Fakultas Kedokteran, Universitas Trisakti, Jakarta, Indonesia

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ABSTRACT

Thyroid storm is an emergency and requires immediate treatment. Diagnosing thyroid storm is difficult because of its clinical symptoms that mimic infection such as tachycardia, high fever, and sometimes shortness of breath. This study employs a case study approach. The research subjects were patients with impending thyroid storm. The research location is in the Emergency Unit of Cibinong Hospital. Data analysis techniques using literature studies. In this case, a 30-year-old man at the Emergency Unit of Cibinong Hospital presented a clinical Impending Thyroid Storm with multi-organ involvement including Thyroid Heart Disease in the form of Atrial Fibrillation, gastrointestinal complaints, Hypoglycemia accompanied by Respiratory Failure. The patient has been diagnosed with Graves Disease for 5 years. Treatment for this patient includes correction of hypoglycemia, diuretics and digoxin. Propylthiouracil (PTU) and Propranolol were given when the FT4 and TSH results were out. After being treated with this therapy, clinically improved, marked by reduced tightness, fever and palpitations. On the ecg examination, atrial fibrillation was not found again. Recognizing Thyroid Storm as early as possible can prevent the severity of complications. Hypoglycemia correction is no less important. PTU therapy, Propranolol, Furosemide, Spironolactone and Digoxin are still good therapeutic modalities to be used, especially in type B hospitals.

Corresponding Author:

Pretika Prameswari,
Fakultas Kedokteran,
Universitas Trisakti,
Jl. Kyai Tapa No.1, RT.5/RW.9, Tomang, Kec. Grogol petamburan, Kota Jakarta Barat, Daerah Khusus Ibukota Jakarta 11440, Indonesia
Email: pretika_p@yahoo.com

INTRODUCTION

Hyperthyroidism is a common condition that occurs in 1.3 percent of the population (Blanco Carrera et al., 2020; Novodvorsky & Allahabadia, 2021). Many achieve euthyroid state with medications and/ or ablation and in some cases surgery. Thyroid storm is a feared complication of the hyperthyroid state (Tan et al., 2021). Thyroid storm is an emergency and requires immediate treatment. Diagnosing thyroid storm is difficult because of its clinical symptoms that mimic infection such as tachycardia, high fever, and sometimes shortness of breath. Hyperthyroid crisis is often confused with sepsis, heat stroke, gastrointestinal infection, or ischemic heart disease. Ocular manifestations are common and usually worsen in thyroid storm. Based on the American Thyroid Association, treatment of thyroid crisis includes beta-blockers, anti-thyroid drugs, iodine, and

corticosteroids. Treatment is supportive by maintaining the patient's body temperature by placing cooling blankets and administering acetaminophen. Patients with thyroid storm should be treated with fluid resuscitation, supportive breathing, and monitoring in an intensive care unit (Sharma & Stan, 2019).

The cause of liver failure in hyperthyroid patients is due to several factors. Cholestatic liver disorder of the intrahepatic lobule was more prominent in the above cases. Cholestasis is failure of the flow of bile into the duodenum in normal amounts. Clinically, cholestasis can be defined as the accumulation of substances excreted in the bile such as bilirubin, bile acids and cholesterol in the blood and body tissues. The patient is said to be cholestatic if the direct bilirubin level is more than 1 mg/dl and the total bilirubin is less than 5 mg/dl. In Grave's disease, cholestasis is associated with an autoimmune disorder that can attack liver cells and cause primary biliary cirrhosis (PBC) or autoimmune hepatitis. This can occur in 10% of patients with hyperthyroidism. Liver damage caused by thyrotoxicosis or hyperthyroidism can also be caused by ischemic hepatitis which occurs due to reduced blood flow to the liver despite increased metabolism. Other mechanisms of liver damage can also be caused by congestive heart failure as in the above case. Antithyroid drugs can also cause hyperbiluribinemia such as propylthiouracil (Yap et al., 2020).

Individuals with hyperthyroidism who develop symptoms of thyroid storm are usually treated in the emergency room. People with thyroid storm generally show an increased heart rate, as well as high blood pressure numbers (systolic blood pressure). Your doctor will measure your thyroid hormone levels with a blood test. Thyroid stimulating hormone (TSH) levels tend to be low in hyperthyroidism and thyroid storm. According to the American Association for Clinical Chemistry (AACC), normal values for TSH range from 0.4 to 4 mIU/L. The T3 and T4 hormones are higher than normal in people with thyroid storm (Blanco Carrera et al., 2020). With proper case management, it can accelerate health healing.

RESEARCH METHOD

This study employed a case study approach (Cronje, 2020; Sugiyono, 2019) . The description of the course of research should be supported references, so the explanation can be accepted scientifically (Fryer & Dinsmore, 2020; Sugiyono, 2018). Subyek penelitian yaitu pasien dengan impending tyroid storm. Tempat penelitian di Unit Gawat Darurat RSUD Cibinong. Teknik analisis data dengan menggunakan studi literatur (Sugiyono, 2017).

RESULTS AND DISCUSSIONS

In this case, a 30-year-old man at the Emergency Unit of Cibinong Hospital presented a clinical Impending Thyroid Storm with multi-organ involvement including Thyroid Heart Disease in the form of Atrial Fibrillation, gastrointestinal complaints, Hypoglycemia accompanied by Respiratory Failure. The patient has been diagnosed with Graves Disease for 5 years. The patient refuses to take medication for more than 3 years. The diagnosis in the Emergency Room is established clinically according to the Burch-Wartofsky Point Scale which is then confirmed in the Inpatient Installation by laboratory tests and ultrasound.

Physical examination found icteric sclera with protrusion in the eye, as shown below:

Figure 1. Results of physical examination of the eyes

Nama Test	Flag	Hasil	Satuan	Nilai Rujukan	Metode
HEMATOLOGI					
DARAH RUTIN :					
Hemoglobin	L	11.7	gr/dL	13.7 - 17.5	Cyanmet
Leukosit	H	11590	/µL	5000 - 10000	Elek Impedance
Trombosit		171000	/µL	150000 - 450000	Elek Impedance
Hematokrit	L	35.3	%	40 - 48	Kalkulasi
KIMIA KLINIK					
Glukosa Sewaktu					
Glukosa Sewaktu	L	62	mg/dL	70 - 200	GOD - PAP
Ureum					
Ureum		30	mg/dL	20 - 40	GLDH
Creatinin					
Creatinin		1.0	mg/dL	0.5 - 1.5	Enzymatic
ELEKTROLIT					
Natrium					
Natrium	L	133	mEq/L	135 - 155	ISE
Kalium					
Kalium		3.9	mEq/L	3.6 - 5.5	ISE
Chlorida					
Chlorida		101	mEq/L	95 - 108	ISE

Figure 2. Laboratory examination results

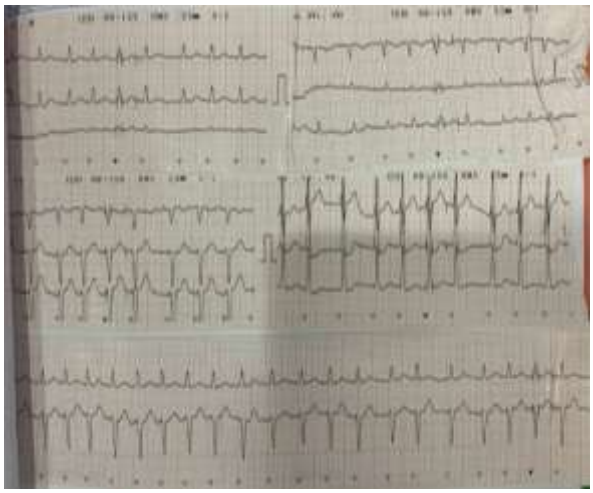

Figure 3. The results of the EKG examination obtained AF RVR

Treatment for this patient includes correction of hypoglycemia, diuretics and digoxin. Propylthiouracil (PTU) and Propranolol were given when the FT4 and TSH results were out. After being treated with this therapy, clinically improved, marked by reduced tightness, fever and palpitations. On the ecg examination, atrial fibrillation was not found again. On vital sign examination, sensorium: compos mentis, blood presure: 110/70 mmHg, Pulse: 120 x/min/irregular respiration 36x/min, temperature 38º C. Physical examination found icteric sclera with protrusion in the eye.

On examination of the neck there was an increase in jugular venous pressure +3 cm and from palpation found a diffuse enlargement of the thyroid gland. Chest examination revealed cardiomegaly with edema in both lungs. Abdominal examination revealed hepatomegaly. Both legs have pre-tibial edema. The results of routine blood laboratory tests found slight anemia, leukocytosis, and thrombocytopenia. Liver function showed increased bilirubin, coagulation tests showed increased d-dimer, and thyroid function tests showed a decrease in TSH. The electrocardiogram (EKG) showed atrial fibrillation with a rapid ventricular response and left ventricular hypertrophy. Echocardiogram showed mitral and pulmonary regurgitation with 43% ejection friction. Thyroid ultrasound showed thyroid enlargement and hypervascularization with the conclusion of grave disease

The diagnosis of hyperthyroidism is based on the presence of exophthalmos and a lump in the patient's neck. The etiology of hyperthyroid crisis can be due to excessive iodine intake, sudden discontinuation of antithyroid drugs, infection, trauma, cerebrovascular disease, severe and emotional stress. In this case the patient lives in an area close to the coast, an area where there is a lot of iodine. There was no history of infection, trauma or cerebrovascular disease. The patient admits irregularity in taking anti-thyroid drugs. Heart failure in hyperthyroidism is due to the effect of thyroid hormone on the cellular mechanisms of the heart muscle and on cardiovascular hemodynamics. In cellular mechanisms, the T3 hormone regulates transcription in cardiac genes and influences ion cannulation, Na/K-ATPase, sodium natriuretic hormone, and others. The T3 hormone affects cardiac hemodynamics by increasing systemic vascular resistance and activating the renin-angiotensin-aldosterone system to withdraw fluid and sodium. T3 also increases the synthesis of erythropoietin thereby increasing the number of red blood cells. The combination of these changes can increase cardiac output 50% to 300% compared with normal people.

Case management was carried out for 3 days, namely the first day of hospitalization, the patient still complained of shortness of breath accompanied by 3 liquid chapters, no bloody mucus, only water. blood pressure 144/89 N 100x/minute, temperature 36.5°C, the therapy given is: - r/ check fl-, - r/ thyroid ultrasound, repeat morning ekg, check ft4, tshs, d5% infusion, do a gds check / 4 hours. On the second day of treatment the shortness of breath has not decreased, the chapters were loose 2 times yesterday blood pressure: 137/98 N 117 x/minute, temperature 36.2°C. On the 3rd day of treatment Shortness of breath is reduced, diarrhea 1x. nausea, composmentis general condition, blood pressure 100/70 mmHg. pulse 88x/minute, respiration 20x/minute.

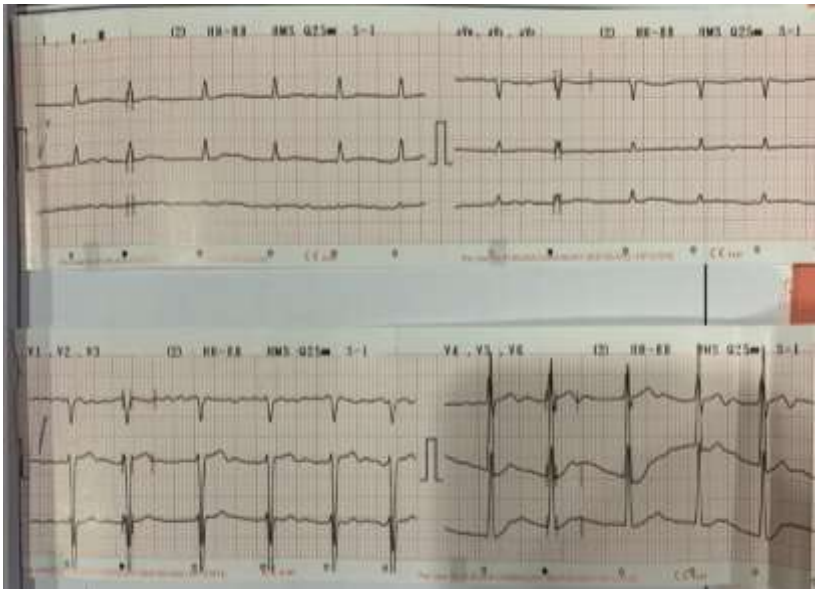

Figure 4. Results of day 3 cardiac recording

A history of associated hyperthyroidism (Grave's disease or toxic multinodullar goiter) is helpful in guiding the diagnosis. In patients with suspected thyroid crisis, look for precipitating factors that might induce thyroid storm (de Mul et al., 2021). Some specific clinical characteristics that strengthen the suspicion of a patient having a thyroid crisis are high fever, tachycardia, nausea, agitation and changes in mental status. In patients with suspected thyroid crisis, assess with the Burch-Wartosky table to calculate the clinical index score for thyroid crisis (Milani et al., 2021; Rao et al., 2021). Thyroid storm requires immediate and aggressive emergency medical attention. If left untreated, thyroid storm can lead to congestive heart failure. The patient may also experience fluid filled lungs. According to an article published in a German medical journal, the mortality rate for people with untreated thyroid storm is 75 percent (Arifandi, 2018).

The thyroid gland is one of the largest endocrine glands in the human body. This gland can be found at the front of the neck, slightly below the larynx. The shape of the thyroid gland is like a butterfly with two wings with a diameter of about 5 cm (Rodriguez & Arzeno, 2017). Under normal circumstances the thyroid gland is not visible and barely palpable. But to more easily find out where the thyroid gland is, you can feel the bulge in the neck (Rodriguez & Arzeno, 2017; Sullivan et al., 2021).

Thyroid storm is a lethal disease that requires early detection and treatment . If these patients had undergone thyroid hormone measurements when their mental or physical statuses had changed, we might have been able to detect and treat their thyroid conditions earlier. CNS manifestations of thyroid storm may include restlessness, delirium, mental aberration, somnolence, convulsions, and coma (Ishihara et al., 2019; Keyal et al., 2020). However, depression, hypomania, and anxiety disorders are the most frequently reported psychiatric findings in patients with hyperthyroidism. The mechanisms for underlying these are thought to involve sympathetic nerve activation, increased β-adrenergic activity, and the autoimmune process. In addition, thyroid hormones are thought to have a modulating effect on the serotonin system in the brain and induce direct effects on cerebral tissue, which cause electroencephalogram abnormalities (Sukmawati, 2018; Tan et al., 2021). However, why CNS manifestations appear during a thyroid storm are unclear.

A lower GCS has been significantly associated with the development of irreversible deficits making it essential that we correctly identify CNS manifestations in patients with a thyroid storm (Sukmawati E et al., 2018). Bipolar disorder affects more than 1% of the world's population, irrespective of nationality, ethnic origin, or socioeconomic status and patients may present with

hypomanic or depressive episodes. By contrast, major depressive disorder is more common, with a worldwide prevalence of 4.4% (10), and patients may present with loss of interest, suppressed thinking, anxiety, fretfulness, sleep disorder, eating disorder, and suicidal ideation. Mental status changes associated with thyroid storm and worsening psychosis can be indistinguishable from these symptoms. Therefore, if the patients have no history of thyroid disease and do not have their thyroid hormone levels measured, their thyroid storm may be overlooked, leading to an unfortunate outcome (Ishihara et al., 2019; Senda et al., 2020).

The mechanism of thyroid storm is not known for certain. Several theories link this occurrence with increased secretion and circulation thyroid hormone. Catecholamine secretion may also play a role in thyroid development storm. In most cases, thyroid storm is associated with a precipitating event (severe physical or mental stress) in patients with uncontrolled or poorly managed hyperthyroidism (Kartika et al., 2018; Rodriguez & Arzeno, 2017; Syahrul & Jasmine, 2019).

CONCLUSION

Recognizing Thyroid Storm as early as possible can prevent the severity of complications. Hypoglycemia correction is no less important. PTU therapy, Propranolol, Furosemide, Spironolactone and Digoxin are still good therapeutic modalities to be used, especially in type B hospitals.

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