International Journal of Science and Research (IJSR)
ISSN: 2319-7064
ResearchGate Impact Factor (2018): 0.28 | SJIF (2018): 7.426

A Case of Thyroid Storm Precipitated By Pneumonia

Christina Permata Shalim[1], Dewi Catur Wulandari[2]

[1]General Practitioner, Wangaya Regional General Hospital, Denpasar, Bali, Indonesia

[2]Internist, Department of Internal Medicine, Wangaya Regional General Hospital, Denpasar, Bali, Indonesia

Abstract: ***Thyroid storm is a rare but life-threatening condition thatrequires rapid diagnosis and appropriate treatment. The symptoms that involve multiple organ systems cause the diagnosis to be difficult because it can mimic other diseases. Thyroid storm is usually precipitated by an acute illness, most commonly infection. The symptoms of the infection itself are often make the diagnosis challenging because they may mask the symptoms of thyroid storm.We present a case of thyroid storm induced by pneumonia in a woman without history of hyperthyroidism or other diseases. Early recognition of thyroid storm and its precipitating factor is important in preventing possible morbidity and mortality for this patient.***

Keywords: thyroid storm, hyperthyroidism, thyrotoxicosis, pneumonia

1. Background

Thyroid storm is a complication caused by excessive amounts of thyroid hormone which is rare but life threatening so it needs to be diagnosed quickly. The mortality rate in this condition is not as common as in the past but stillestimated to be8-25%.[1]

The symptoms that involve multiple organ systems cause the diagnosis to be difficult because it can mimic other diseases. Thyroid storm is usually precipitated by an acute illness, such as stroke, infection, trauma, surgery, or radioiodine treatmentof a patients with partially treated or untreated hypertyroidism.[2]Infection is the most common precipitating factor for thyroid storm and the symptoms of the infection itself are often make the diagnosis challenging because they may mask the symptoms of thyroid storm.[3]

Here, we present a case of thyroid storm likely precipitated by pneumonia.

2. Case Report

A 41-year-old, female patient presented in the emergency department with 1 week history of nausea and vomiting. She also had cough with sputum, shortness of breath, palpitation, subjective fever, and excessive sweating. There was unintentional weight loss of 17 kg over the last 2 months, anxiety, and heat intolerance. She denied any stomach or chest pain. Her past medical history was unremarkable, with no known personal or family history of thyroid diseases.

On presentation, she was agitated and diaphoretic. Her Glasgow Coma Scale was 15. She was tachycardic to 140 bpm, subfebrile to 37.4°C, and tachypneu with respiratory rate 40 times/minute. Her blood pressure was stable at 130/90 mmHg. The physical examination showed mild exophthalmos, slightly enlarged thyroid, and a fine tremor on both hands. Chest examination revealed mild rhonchi and wheezing bilaterally throughout all lung fields.

Initial laboratory studies revealed hypokalemia (serum potassium:2.8 mmol/L) and increased AST (122 U/L) and ALT (100 U/L) level. Complete blood count was within normal limit with white blood cell (WBC) count 6.08 x 10^3/uL, hemoglobin 12.2 g/dL, hematocrit 36.9%, and platelet count 248 x 10^3/uL. Chest X-ray showed bronchopneumonia (Figure 1). Her electrocardiogram at that time showed sinus tachycardia with heart rate 125 bpm (Figure 2).

Thyroid function tests cannot be done at that time and was planned to be done the next day, so for early diagnosis approach we tried to diagnosed hyperthyroidism based on clinical symptoms andsigns using Wayne's Index. In this patient the Wayne's Index score was at least 22 which was considered toxic.

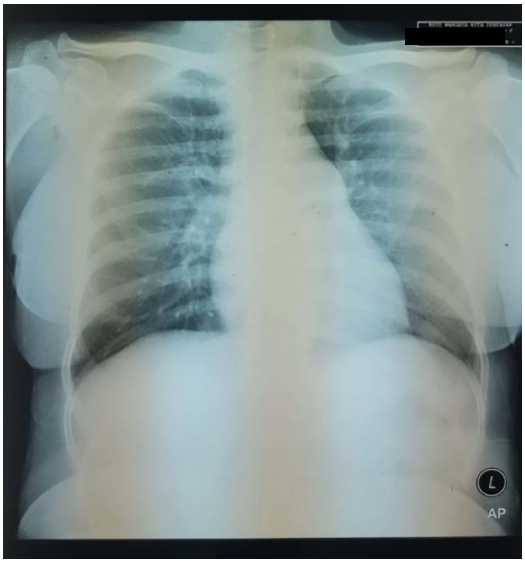

Figure 1: Patient's chest X-Ray

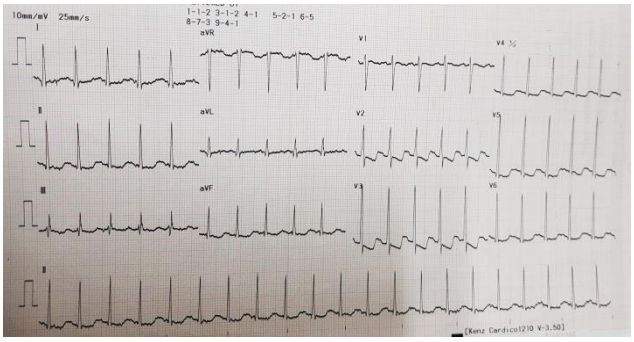

Figure 2: ECG on admission

Burch-Wartofsky score was used to assess the thyroid storm probability in this patient. Patient's Burch-Wartofsky score was calculated to be 60,which was highly suggestive of thyroid storm.

The patient was admitted to the intensive care unit (ICU) and immediately treated for thyroid stormwith propylthiouracil (PTU) 200 mg every 6 hours, propranolol 20 mg every 8 hours, and hydrocortisone 100 mg every day. Lugol's solution was planned to be given but it was not available in our hospital at that time.Empiric antibiotic ceftriaxone intravenously also given for the pneumonia that has been diagnosed based on the clinical symptoms that patient had, physical examination, and her chest X-ray. Nebulization with salbutamol/ipratropium bromide was also given. For the hypokalemia, patient was givenpotassium chloride 50 mEq intravenous solutiondiluted in 0.9% sodium chloride with infusion rate12 drips/minute. Other symptomatic therapy also given, including paracetamol, ranitidine, ondansetron, and ambroxol.

Patient's thyroid function tests on the next day were: thyroid stimulating hormone (TSHs) <0.01 µU/mL (normal range 0.27 to 4.27 µU/mL) and free thyroxine (FT4) 37.00 ng/dL (normal range 0.93-1.70 ng/dL). After potassium chloride infusion, the serum kalium level was improved: 4.2 mmol/L.

During admission, patient's blood pressure tendsto be high with systolic blood pressure ranged from 150-160 mmHg. Antihypertensivedrug was initiated with captopril 25 mg every 12 hours.On day 3 of admission, patient's symptoms begin to improved and her heart rate became normal 80 bpm. Propanolol dose was lowered to 20 mg every 12 hours.On day 4 of admission, patient had stable condition and discharged from the ICU to be admitted in general ward. Thyroid ultrasound was done and revealed bilateral thyroiditis, left multiple thyroid nodule, and non specific multiple bilateral cervical lymphadenopathy (Figure 3).

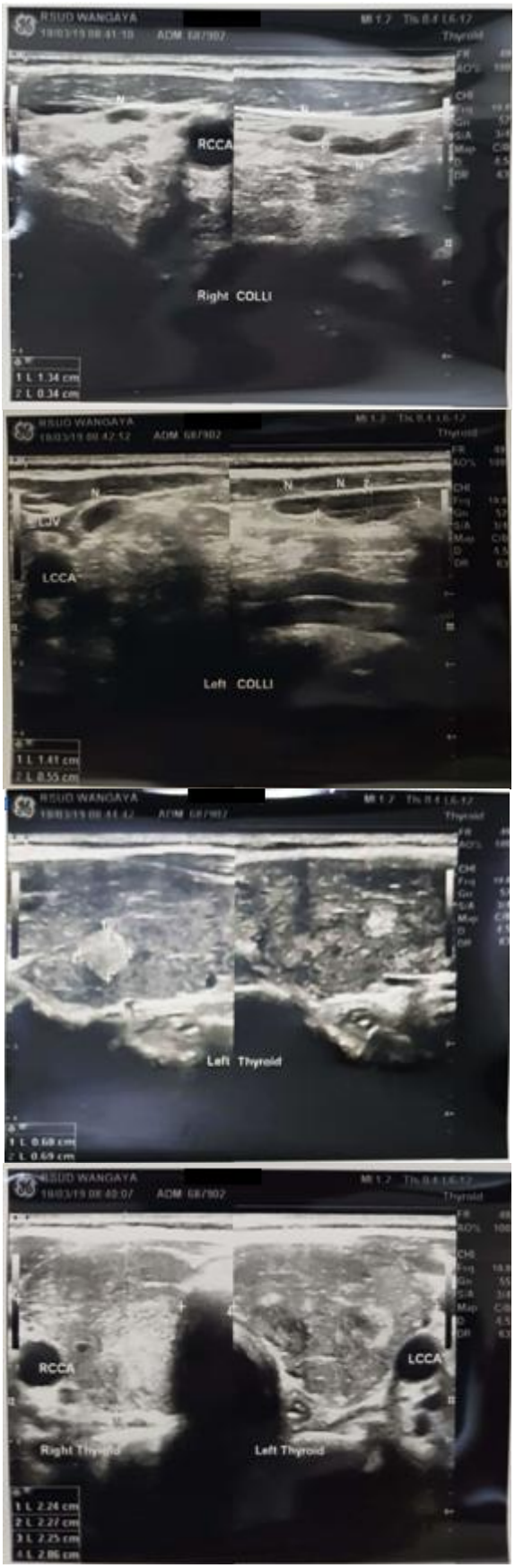

Figure 3: Thyroid ultrasound

Treatment was continued until day 7 of admission. The only symptom that patient felt was mild shortness of breath. Patient discharged with oralmedications: PTU 200 mg 3 times a day, propranolol 10 mg twice a day, captopril 25 mg

twice a day, andantibiotics including cefixime and azithromycin for 5 days. For her next visit, we also planned to evaluateher transaminase level because hepatotoxicity is one of the major adverse effect of antithyroid therapy such as PTU or methimazole, so her liver function should be monitored regularly during her therapy and that would be one of the considerations for dose adjustment.

3. Discussion

Thyroid storm is alife-threatening manifestation of hyperthyroidism. In this case report, a woman without history of hyperthyroidism or other diseases came to the emergency department with gastrointestinal symptoms of nausea and vomiting.

Classic clinical symptoms of thyroid storm include fever, marked tachycardia, heart failure, tremor, nausea, vomiting, diarrhea, dehydration, anxiety, delirium, even coma.[3] In this patient the main complaint was nausea and vomiting, which turned out to be accompanied by fever and severe tachycardia. The patient also seemed agitated, even though the patient was still fully conscious.

Signs and symptoms that show decompensation in organ systems may also present, such as delirium, peripheral edema, hepatomegaly, and respiratory failure. Sinus tachycardia andtachyarrhythmia such as atrial fibrillation are also common.[4] In this patient we found sinus tachycardia and elevated transaminase, but other physical findings as a result of other organ systems decompensation was not be found.Clinical picture of the patient can also be masked by the presence of an infection that precedes the thyroid storm, such as pneumonia, viral infection, or upper respiratory tract infection.

Hypokalemia in a patient with hyperthyroidism is usually associated with the condition of hypokalemic periodic paralysis which is a rare complication of hyperthyroidism characterized by acute paralytic attacks and hypokalemia. In this patient, hypokalemia was present but there was no paralysis. This might be due to the need for lower potassium levels to cause paralysis. In a case report that reviewed 9 cases of hypokalemic periodic paralysis, potassium levels of 1.1-2.3 mmol/L were found in all of these cases, whereas our patient's potassium levels was 2.8 mmol/L.[5]

To diagnose thyroid storm, first we have to confirm the hyperthyroidism status in the patient. Because laboratory confirmation often delayed, Wayne's index still helpful to diagnose hyperthyroidism based on the clinical signs and symptoms. This diagnostic index scores the presence or absence of various signs and symptoms of hyperthyroidism for establishing a diagnosis (Table 1).[6,7] Then, thyroid function tests should be ordered to confirm the diagnosis.

Table 1: Wayne's Index[7]

Symptoms	Score	Signs	Present	Absent
Dyspnoea on exertion	+1	Palpable thyroid	+3	-3
Palpitation	+2	Bruit	+2	-2
Tiredness	+2	Exophthalmos	+2	-
Preference for heat	-5	Lid retraction	+2	-
Preference for cold	+5	Lid lag	+1	-
Excessive sweating	+3	Hyperkinesis	+4	-2
Nervousness	+2	Hands hot	+2	-2
Increased appetite	+3	Hands moist	+1	-1
Decreased appetite	-3	Pulse rate >80/m	-	-3
Decreased weight	+3	Pulse rate >90/m	+3	-
Increased weight	-3	Atrial fibrillation	+4	-
Total score interpretation >19 = toxic 11-19 = equivocal <11 = euthyroid				

The diagnosis of thyroid storm is based on the clinical symptoms experienced by the patient. The Burch-Wartofsky score can help to diagnose this condition. This scoring system assigns points in the categories of thermoregulatory dysfunction,central nervous system effects, gastrointestinal-hepatic dysfunction, cardiovascular dysfunction and precipitant history. These points are totaled and a score of 45 or more indicates a highly suggestive thyroidstorm (Table 2).[1,4] In this patient, the total score when the patient comes to the ER was 60.

Thyroid storm is usually precipitated by an acute illness, such as stroke, infection, trauma, surgery, or radioiodine treatment. In this case, pneumonia that patient had may be the precipitator of her thyroid storm.

After the diagnosis of thyroid storm is being made, appropriate therapy has to immediately be given. Admission to an ICU is usually required. Specific therapies for thyroid stormincluding antithyroid drugs (PTU or methimazole), iodide compound, propranolol, and corticosteroid such as dexamethasone or hydrocortisone [1,4]

Antithyroid drugs directly inhibit thyroid peroxidase through the coupling of iodotyrosine in thyroglobuline molecules. The major advantage of PTU compared to methimazole is that PTU inhibit deiodination of T4 and therefore acutely decrease T3 levels more than methimazole. This PTU's action makes it the antithyroid drug of choice on thyroid storm case.[2,4]

Iodide compound, such as Lugol's solution or saturated solution of potassium iodide (SSKI) in large doses can block the thyroid hormone synthesis and release by inhibiting iodide oxidation and organification (the Wolff-Chaikoff effect). This iodide solution should be administered at least one hour after the administration of antithyroid drugs because iodine could stimulate thyroid hormone synthesis. The delay allows the antithyroid drugs to prevent excess iodine from being used to synthesize new hormone.[2,4]

Propranolol is given to reduce tachycardia and other adrenergic manifestations. Other beta blockers can be used for these effects, but high doses of propranolol decrease conversion of T4 to T3 and the doses can be easily adjusted, therefore it becomes beta blocker of choice on thyroid storm.[1,2]

Corticosteroid such as dexamethasone or hydrocortisone should also be started because there might be an adrenal insufficiency caused by thehypermetabolic state in thyroid storm. Large doses of

corticosteroids have also been shown to inhibit peripheral conversion of T4 to T3.[4]

Supportive therapy should be initiated based on the patient's condition and symptoms. In this case, an infection that likely precipitated thyroid storm is treated with antibiotics.Treatment of hypokalemia in a patient with hyperthyroidismincludes correction of hypokalemia intravenously or orally and treatment of the underlying hyperthyroid state.As for patient's symptoms such as nausea and fever, symptomatic drugs should be administered.[4,8]

Table 2: The Burch-Wartofsky Point Scale[4]

Criteria	Points
Thermoregulatory dysfunction	
Temperature (°C)	
37.2-37.7	5
37.8-38.3	10
38.4-38.8	15
38.9-39.4	20
39.4-39.9	25
≥40.0	30
Cardiovascular	
Tachycardia (beats per minute)	
100-109	5
110-119	10
120-129	15
130-139	20
≥140	25
Atrial fibrillation	
Absent	0
Present	10
Congestive heart failure	
Absent	0
Mild	5
Moderate	10
Severe	20
Gastrointestinal-hepatic dysfunction	
Manifestation	
Absent	0
Moderate (diarrhea, abdominal pain, nausea/vomiting)	10
Severe (jaundice)	15
Central nervous system disturbance	
Manifestation	
Absent	0
Mild (agitation)	10
Moderate (delirium, psychosis, extreme lethargy)	20
Severe (seizure, coma)	30
Precipitating event	
Status	
Absent	0
Present	10
Total score	
>45	Thyroid storm
25-45	Impending storm
<25	Storm unlikely

Once the patient is stable, the etiology of hyperthyroid underlying thyroid storm should be investigated. Thyroid ultrasoundcan be useful for evaluation of gland's volume, echogenicity, vascularity, and presence of nodular disease.[8]

4. Conclusion

Early recognition of thyroid storm and its precipitating factor is important in preventing possible morbidity and mortality. Approriate therapy has to immediately be given, including specific therapy for the thyroid storm and supportive therapy based on the patient's condition and symptoms.

References

[1] Ross DS, Burch HB, Cooper DS, Greenlee MC, Laurberg P, Maia AL, et al. 2016 American Thyroid Association Guidelines for Diagnosis and Management of Hyperthyroidism and Other Causes of Thyrotoxicosis. Thyroid [Internet]. 2016 Oct [cited 2019 Apr 9];26(10):1343–421. Available from: http://www.ncbi.nlm.nih.gov/pubmed/27521067

[2] Jameson JL, Kasper DL, Longo DL (Dan L, Fauci AS, Hauser SL, Loscalzo J. Harrison's principles of internal medicine. 20th ed. McGraw-Hill Education / Medical; 2018.

[3] Groot LJ De, Bartalena L, Feingold KR. Thyroid Storm. 2018 Dec 17 [cited 2019 Apr 9]; Available from: https://www.ncbi.nlm.nih.gov/books/NBK278927/

[4] Satoh T, Isozaki O, Suzuki A, Wakino S, Iburi T, Tsuboi K, et al. 2016 Guidelines for the management of thyroid storm from The Japan Thyroid Association and Japan Endocrine Society (First edition). Endocr J [Internet]. 2016 [cited 2019 Apr 9];63(12):1025–64. Available from: https://www.jstage.jst.go.jp/article/endocrj/63/12/63_EJ16-0336/_article

[5] Clarine LHS, Hosein N. Thyrotoxic Periodic Paralysis: A Review of Cases in the Last Decade. AACE Clin Case Reports [Internet]. 2015 Jun 13 [cited 2018 Sep 13];1(3):e182–6. Available from: http://journals.aace.com/doi/10.4158/EP14304.CR

[6] S. N, David S. SK, K. R, B. K. EP. Accuracy of Wayne's criteria in diagnosing hyperthyroidism: a prospective study in south Kerala, India. Int Surg J [Internet]. 2018 Mar 23 [cited 2019 Apr 17];5(4):1267. Available from: http://www.ijsurgery.com/index.php/isj/article/view/2740

[7] Sabir A, Abubakar S, Fasanmade O, Haruna G, Iwuala S, Ohwovoriole A. Correlation between wayne′s score and laboratory evidence of thyrotoxicosis in Nigeria. Sub-Saharan African J Med [Internet]. 2014 [cited 2019 Apr 17];1(3):142. Available from: http://www.ssajm.org/text.asp?2014/1/3/142/138944

[8] Papi G, Corsello SM, Pontecorvi A. Clinical concepts on thyroid emergencies. Front Endocrinol (Lausanne) [Internet]. 2014 [cited 2019 Apr 23];5:102. Available from: http://www.ncbi.nlm.nih.gov/pubmed/25071718