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THYROTOXIC PERIODIC PARALYSIS

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Thyrotoxic periodic paralysis is a weakness or paralysis of muscle caused by reversible imbalance electrolyte hypokalaemia which associated with hyperthyroid condition. TPP mostly affected Asian population with 20-40 years old group age. Men affected more than women with ratio 20:1. A Man, Balinese, 41 years old with chief complain sudden weakness in both legs, palpitation, increasing appetite but body weight decreased. Wayne's index score was 20, Thyroid Stimulating Hormone result 0.19 IU/ml, FT4 result 48,42 pmol/L, Kalium result 2,2 mmol/L. Early treatment was twice given KCl 50 meq drip in RL infusion 500cc, PTU 100 mg 3 times, KSR 3x1, propranolol 10 mg two times. Hyperthyroid condition increased Na/K-ATPase activity resulted kalium influx into cell which led to hypokalaemia. Early management of TPP is kalium replacement therapy to relieve paralysis. Definitive therapy of TPP is controlling hyperthyroid with antithyroid drug and maintain euthyroid condition. Beta blocker groups such as propranolol used to inhibit Na/K-ATPase activity and effectively prevent relapsed.

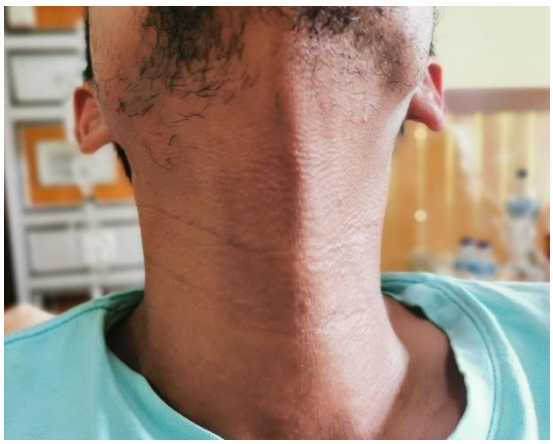
INTRODUCTION

Periodic hypokalemia paralysis is a neuromuscular disorder characterized by recurrent weakness of the muscles followed by low levels of potassium in serum (Sumantri, 2009). Some triggers include high consumption of carbohydrates, trauma, exposure to cold or after strenuous physical activity, and the effects of certain drugs. Patients can experience repeated attacks at various intervals (Suiraoka, 2012). Periodic hypokalemy paralysis is grouped into Familial Periodic Hypokalemy Paralysis and acquired hyperthyroid state, called Periodic Hyperthyroid Paralysis (Aritonang & Leniwita, 2019).

Periodic hyperthyroid paralysis is an emergency in the neuroendocrine field and a rare case with an estimated incidence of about 2% of patients suffering from hyperthyroidism (LER, n.d.). This case is more frequent in Asian descent (Nasrudin, 2018). Men reported more periodic hyperthyroid paralysis than women with a male to female ratio of 20:1 (PAPDI, n.d.). The case is characterized by an attack of acute paralysis and hypokalemy associated with hyperthyroidism (Yudhawati, Adnyani, Nugraha, & Gotera, 2022). Recognizing signs and symptoms and establishing early diagnosis is important for faster management. Potassium correction and definitive treatment with antithyroid drugs (Muhsina et al., 2023). In this case, it was reported that a man had weakness in the legs and accompanied by hyperthyroidism.

Case

The man with the initials IBGE, age 41 years, Balinese tribe, Indonesia came to the emergency room of Klungkung Hospital with the main complaint of weakness in both legs which was felt suddenly since 1 hour before entering the hospital at dawn when the patient was about to go to the toilet. Weakness is felt from thigh to toe, the patient cannot walk and lift his legs but the patient can still move his legs (Fawwaz & Suandika, 2023). Weakness of both patients' legs is not accompanied by complaints of tingling, pain in the legs, seizures, fever, and no history of bumping or previous trauma (Kosat, 2019). According to the patient, in the last two months the patient felt chest palpitations, often felt anxious or nervous, could not stand the heat and sweated a lot even in a cold atmosphere, increased appetite, but weight was said to decrease approximately 5 kg. The patient does not feel any lumps on the patient's neck, there are no swallowing disorders, hoarseness. One month earlier, the patient was treated at Klungkung Hospital with Periodic Paralysis and hypokalemi, according to the patient at that time it was the first time the patient felt complaints of weakness in the patient's legs. At a family history of the disease no one suffers from the same complaints as patients.



Gambar 1. Regio Coli Pasien

On physical examination, the patient appears to be moderately ill, compostural consciousness, blood pressure 140/80 mmHg, pulse frequency 98 times/minute, strong, regular, respiration frequency 20 times/min, axillary temperature 36.8oC,

oxygen saturation 99% with room temperature. On eye examination, ecsoftalmus were not obtained, neither anemic nor icteric looks. Examination of the status of localis regio colli does not obtain thyroid enlargement, in auscultation does not sound bruit. On thoracic examination, symmetrical breathing movements, vesicular breathing sounds in both lung fields, no *ronkhi* and *whezing* were heard, heart sounds 1 and 2 were single, regular, murmurs were not heard. On examination of the abdomen found no distention or muscular defans, intestinal noise within normal limits, hepa, lien not palpable enlarged. Extremities obtained warm acral, no edema, motor strength of upper extremities 555/555 and lower extremities 222/222, sensory examination within normal limits, physiological reflexes of lower extremities decreased, patella +1/+1, achiles +1/+1 and no pathological reflexes. Based on history and physical examination, a Wayne Index of 20 was obtained, obtained from symptoms of palpitations, fatigue, cold air love, excessive sweating, increased appetite, weight loss, finger tremors, hands feel hot and sweaty or wet, pulse frequency more than 90 times / minute.

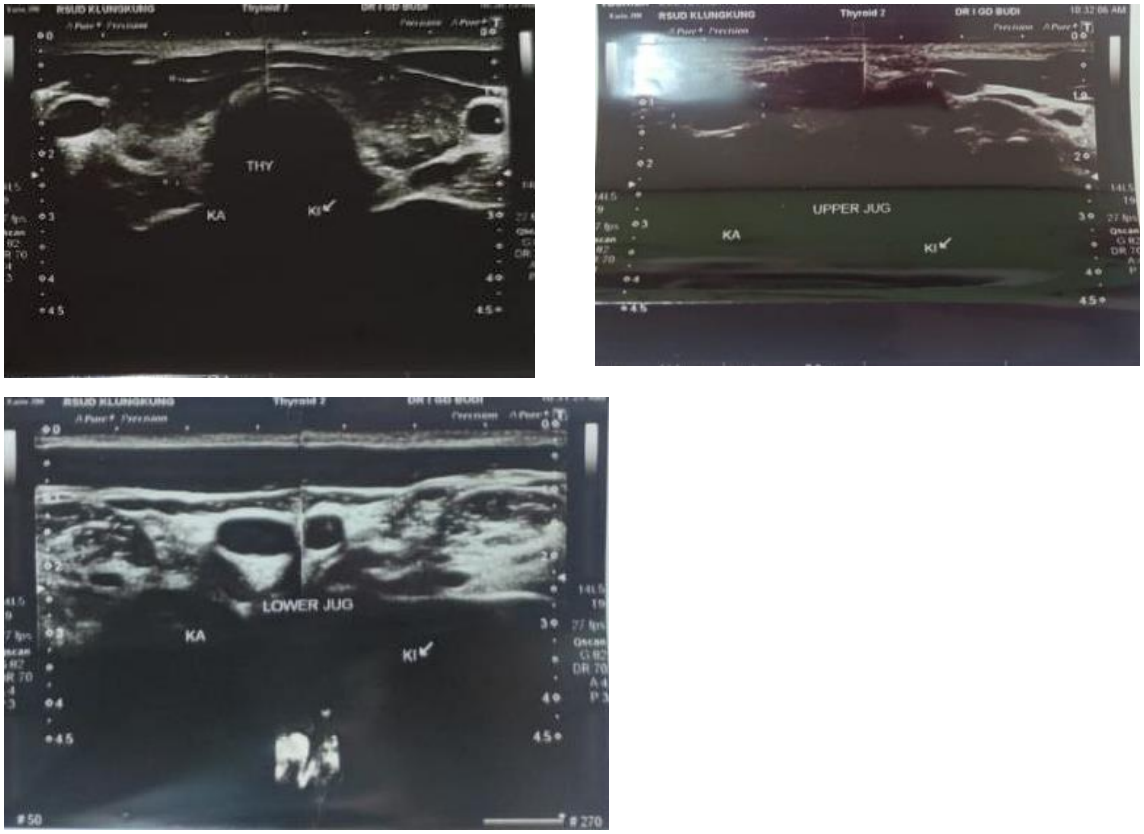
Tabel 1. Indeks Wayne

Gejala	Skor	Tanda	Skor	
			Jika Ada	Tidak Ada
Sesak nafas	+1	Teraba kelenjar tiroid	+3	**-3**
Berdebar-debar	**+2**	Bising tiroid (*bruits*)	+2	**-2**
Mudah lelah	**+2**	Eksoftalmus	+2	**0**
Senang udara panas	-5	Kelopak mata tertinggal oleh gerakan bola mata	+1	**0**
Senang udara dingin	**+5**	Hiperkinetik	+4	**0**
Keringat berlebihan	**+3**	Tremor jari	**+1**	0
Gugup	**+2**	**Tangan Panas**	**+2**	-2
Nafsu makan meningkat	**+3**	**Tangan basah**	**+1**	-1
Nafsu makan menurun	-3	Atrial fibrilasi	+4	0

Berat naik	badan	-3	Denyut nadi :		
			<80	-3	
			80-90	0	
			>90	**+3**	
Berat turun	**badan**	**+3**			
			Total Skor : 20	Interpretasi	Toxic Thyroid

Interpretasi :
>19 : toxic
11-19 : equivocal
<11 : euthyroid/non toxic

In laboratory examination at the beginning of MRS obtained Hb levels 14.8 g / dL, leukocytes 8.07 x 103 / µL hematocrit 47.9%, platelets 302 x 103 / µL, urea 34 mg / dL, creatinine 0.8 mg / dL, sodium 143 mmol / L, potassium 2.2 mmol / L, chloride 103 mmol / L, FT4 48.42 mmol / L (9-22), TSH 0.19 uIU / ml (0.4 - 4.2). On thyroid ultrasound examination obtained results as shown in figure 2, the right, left thyroid and isthmus size did not enlarge, the intensity of normal echoparenchyme did not appear nodules, did not appear cysts / calcifications, in color doppler there was an increase in vascularization of the right and left thyroid and isthmus the impression of hyperthyroidism dd / thyroiditis. Based on the history, physical examination and supporting examinations performed were concluded patients with hyperthyroidism hypokalemy periodic paralysis. The initial therapy given is KCl drip 50 meq in 500 cc RL in 2 administrations, extra fruit diet (high potassium), KSR 3x1 tab, PTU 3x100 mg, potassium evaluation tomorrow after KCl administration.



Gambar 2. Hasil Pemeriksaan *Ultrasonography* Tiroid

Figure 2. Results of *Thyroid Ultrasonography* Examination

On October 12, 2022, the patient still felt weak but was able to move his legs and began to walk on his own. Pounding is said to start to decrease, there are no sleep disturbances, eating and drinking is good. Laboratory results of potassium obtained results of 5.0 mmol / L. Therapy given infusion replaced with NaCl 0.9% 20 tpm, PTU 3x100 mg, KSR postponed, drip KCl stop, extra fruit diet, re-evaluation of potassium tomorrow. On October 13, 2022, complaints of weakness have improved, legs can be moved and do not feel weak. Potassium laboratory results obtained results of 4.1 mmol / L. Therapy given infusion RL 20 tpm, PTU 3x100 mg, KSR 3x1, potassium evaluation tomorrow. On October 14, 2022, the patient had no complaints, the potassium laboratory results were obtained at 3.8 mmol / L, the patient was discharged with PTU therapy 3x100 mg and KSR 3x1 sachets, control of the Internal Medicine Polyclinic of Klungkung Hospital 3 days later and potassium evaluation during control. When the control on October 17, 2022, the patient had no complaints,

while at home the patient did not experience complaints of weakness in the legs, palpitations were said to be reduced. The results of potassium examination obtained results of 4.2 mmol / L. Therapy continued PTU 3x100 mg and KSR 3x1, patients were advised control 1 week later and re-evaluation of potassium during control. Control patients on October 24, 2022, patients have no complaints during control and potassium results 4.5 mmol / L. Therapy is continued PTU 3x100 mg and KSR 3x1, patients are advised to control every month.

RESEARCH METHODS

The method used in this research is the distribution of questionnaires. The questionnaires were distributed in January 2023 to the students of the Midwifery Department at Poltekkes Kemenkes Jakarta I who are above 17 years old. In this study, there are six variables to be examined, consisting of five independent variables and one dependent variable. The variables are Tangibles, Reliability, Responsiveness, Assurance, and Empathy, which are the independent variables. Student satisfaction is the dependent variable.

RESULTS AND DISCUSSION

Muscle disorders characterized by episodic or recurrent muscle weakness without sensory disturbances or decreased consciousness are conditions called periodic paralysis (Yudhawati et al., 2022). Periodic paralysis is grouped into periodic primary or familial paralysis and periodic secondary or acquired paralysis (Aritonang & Leniwita, 2019). In periodic familial hypokalemy, paralysis is inherited autosomally dominant caused by mutations in genes that regulate natirum, potassium, and calcium ion channels, causing excessive influx of potassium into intracellular skeletal muscle and decreased calcium influx into skeletal muscle cells causing muscle cells to be unable to textitate resulting in weakness or paralysis. In periodic secondary or acquired paralysis, one of them is in hyperthyroid conditions or periodic hyperthyroid paralysis.

High thyroid hormones in circulation resulting in increased thyroid hormone activity cause a clinical condition called thyrotoxicosis (Yen et al., 2023). Some of the symptoms that arise include palpitations, cannot stand the heat, increased appetite but accompanied by decreased weight, excessive sweating, tremors, excessive sweating. The diagnosis of hyperthyroidism is established through anamnesis, physical examination and support (Suparman, 2021). The Wayne Index consisting of 9 symptoms and 10 signs can be used to assist in establishing the diagnosis of

hyperthyroidism (Kurniati et al., 2017). To establish the diagnosis, TSH examination can be done first

times when TSH levels are decreased and accompanied by high levels of thyroid hormones (fT3 and fT4) in the blood.1,6,7

Periodic hyperthyroid paralysis (HPP) is a rare case characterized by the triad, namely the occurrence of muscle weakness, low potassium levels and accompanied by hyperthyroid conditions (LER, n.d.). Most cases of HPP occur in Asia sporadically (Umum, n.d.). The incidence of HPP is estimated at 2% of hyperthyroid patients in Asians while 0.1 – 0.2% in non-Asian populations. COGS usually occurs in the age group of 20-40 years, this is what distinguishes it from Familial Periodic Paralysis which is more common at the age of less than 20 years (Aisah & HE, 2016). Although hyperthyroidism has a higher incidence in women, the incidence of COGS is more common in men, which is more than 95% of COGS cases, with the ratio of men and women ranging from 17:1 to 76:1.1,8

Clinical symptoms of hyperthyroidism in HPP patients can occur months or even years before the onset of the periodic condition paralysis, but can also occur together. A typical attack of HPP is characterized by recurrent and transient muscle weakness usually affecting the lower limbs. Sensory function, bowel activity, and voiding are not affected. Attacks of muscle weakness vary between frequencies, durations and intervals between attacks. Precipitating factors for HPP include high carbohydrate intake, during istiratah after heavy physical activity, after exposure to cold, alcohol, or after taking drugs such as beta-2 adrenergic bronchodilators.3,9 The diagnosis of HPP is established based on clinical manifestations and supporting examinations. The classic triad of HPP is flaccid paralysis, the presence of signs of thyrotoxicosis and hypokalemy confirmed by laboratory examination.2

Potassium levels in cells are regulated by the activity of Na/K pumps and Kir channels. Both of these channels can be affected by several conditions, such as thyroid hormones, catecholamines, androgens, and insulin. Thyroid hormones enter cells and bind to Thyroid Hormone-Response Elements (TREs) found in the upstream region of the Na/K pump gene. In addition, thyroid hormones also work synergistically and increase Na/K pump activity. This increase in activity from the Na/K pump causes influx or transfer of potassium into cells, causing hypokalemi.8 Hyperthyroidism stimulates the occurrence of hyperadrenergic conditions, namely increased sensitivity of beta receptors so that they occur Beta adrenergic stimulation of muscle cells mediated by catecholamines. This condition causes increased Na/K-ATPase activity and induces potassium uptake.1,3,10 Catecholamines and insulin cause increased potassium transport into cells through two mechanisms, first by inhibiting Kir channel

activity and second by increasing Na/K-ATPase activity.8 The effect of increasing Na/K-ATPase activity causes potassium to enter the cell excessively resulting in hypokalemi. This causes muscle cells to be unable to electrically excite or hyperpolarize from the muscle membrane, causing weakness and even paralysis of the muscles.1,4,5,9 HPP cases are reported to be more common in men than women, although cases of hyperthyroidism usually affect women more. It is associated with the hormone testosterone which works by increasing Na/K-ATPase activity while the estrogen hormone inhibits Na/K-ATPase activity.8

Early management in patients with paralysis with hypokalemia, immediate oral or intravenous administration of KCl supplements is necessary to prevent cardiopulmonary complications and to aid recovery from muscle paralysis.1,12 The dose of KCl administration ranges from 40 to 200 mEq. Patients who received KCl supplements experienced faster improvement in paralysis complaints than patients who were only given normal saline. Excessive potassium administration can trigger rebound hyperkalemi, which occurs in about 30% of HPP patients with potassium levels > 5.0 mEq / L.1,2 Definitive management of HPP includes controlling hyperthyroidism with anti-thyroid drugs and maintaining euthyroid conditions. Propylthiouracil at a dose of 200-600 mg divided into 3 doses, methimazole 20-60 mg once daily, radioiodine therapy, and thyroidectomy surgery can be considered as therapeutic options.2,12 Non-specific beta blocker drugs such as propranolol also reduce the frequency and severity of episodes of paralysis. Propranolol is also known to be effective in preventing recurrent HPP attacks by inhibiting the activity of Na/K-ATPase.1,8,9

CONCLUSION

A male patient, 41 years old, Balinese tribe, Indonesia, with Hyperthyroid Periodic Paralysis (HPP). Patients with the main complaint of weakness in both legs suddenly accompanied by chest palpitations. The results of laboratory tests found that FT4 increased, TSH decreased, and potassium decreased. Patients were corrected potassium with KCl 50 Meq in 500 cc RL infusion solution, PTU 100 mg every 8 hours orally, and KSR 1 sachet every 8 hours, patient complaints improved after the first day of therapy.

Hyperthyroid Periodic Paralysis (HPP) is a rare case, affecting more young men between 20-40 years, and Asians. Patients usually present with the main complaint of acute paralysis accompanied by a decrease in potassium levels in the blood and hyperthyroid conditions. Fast and precise diagnosis and treatment are important to prevent complications, especially in the cardiovascular system. The target of therapy in this case is to control hyperthyroidism and prevent recurrence.

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