Cardiac Tamponade in a Patient With Hypothyroidism: A Case Report

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Abstract

Cardiac tamponade as a manifestation in newly diagnosed hypothyroidism is a rare condition because fluid accumulate slowly. We present a 38-year-old woman with massive pericardial effusion with cardiac tamponade findings in echocardiography without hemodynamic disturbance. Pericardiocentesis was done, but pericardial effusion was not improved. Other secondary causes of pericardial effusion including inflammation, infection, autoimmune disease, and malignancy were ruled out. The patient had a history of thyroidectomy 4 years prior and thyroid function test confirm the diagnosis of hypothyroidism. The patient was given levothyroxine with initial dose of 400 mcg and continued with 100 mcg daily. The pericardial effusion significantly improved in a week.

Keywords: *cardiac tamponade, hypothyroidism, levothyroxine*

Introduction

Cardiac tamponade is a life threatening heart compression caused by accumulation of fluid, pus, blood, blood clot, or gas resulting from inflammation, trauma, cardiac rupture, or aortic dissection. (1, 2)

In hypothyroidism induced cardiac tamponade, atypical symptoms such as syncope, fatigue, dyspnea, lower extremity edema, or even gastrointestinal manifestations are often found and tachycardia is absent. (1, 2)

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Incidence of pericardial effusion caused by hypothyroidism are around 3-37% and it mainly occurs on severe hypothyroidism but no data about cardiac tamponade. (3, 4)

Diagnosis of hypothyroidism as a cause of pericardial effusion is made if related to increased TSH and other secondary causes have been ruled out. Early recognition of thyroid disorder can prevent complication and mediate prompt treatment. Its management consists of hormone replacement therapy and pericardial drainage in tamponade cases. (3)

Case Illustration

A 38-year-old female was admitted because of dispneu since a month. She also felt heaviness on her chest. She also complained extremity swelling. Patient had history of thyroidectomy in 2014 without routine follow-up.

Patient was alert, blood pressure was 110/70 mmHg with paradoxical pulse, pulse rate was 67 x/min, respiration rate 24 x/min, and temperature was 36.2^{o}C with pitting edema on all extremities.

Laboratory results show: haemoglobin 14.6 g/dl, haematocrit 44 %, leucocytes 6.090 /µL with neutrophil 72.9 %, lymphocytes 15.7 %, platelets 324.000/µL, AST 25 U/L, ALT 10 U/L, albumin 3.3 g/dL, BUN 8.28 mg/dL, creatinine serum 0,89 mg/dl, and blood glucose 104 mg/dl, ESR 28 mm/h, CRP 0.1, C3 116 mg/L, C4 32.9 mg/L, ANA test 8.94, FT4 0.12 µg/dL (Normal: 4.5-10.9 µg/dl) and TSH 106.726 uIU/mL (Normal: 0.55-4.78 uIU/mL)

Chest X-ray revealed cardiomegaly and "water bottle sign". Electrocardiography revealed regular sinus rhythm at 67 x/min and low voltage.

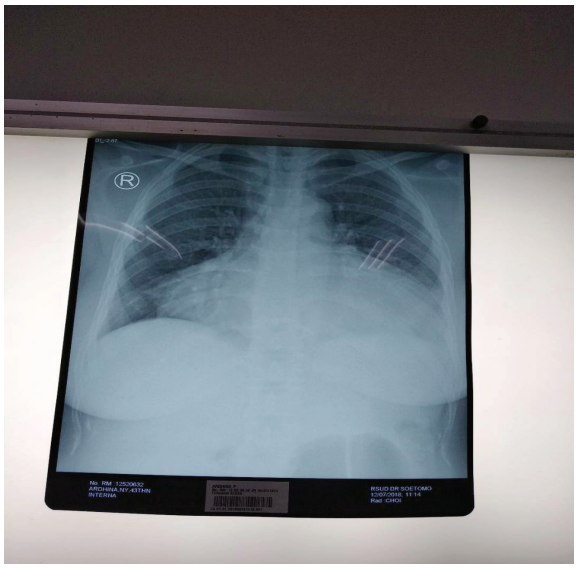

Figure 1: Chest xray show water bottle sign

Echocardiography show, concentric LVH, normal left ventricular systolic function with EF by Teich 63%, and diastolic function show abnormal relaxation. Massive pericardial effusion was present in anterior (2.1 cm), posterior (2.6 cm), left lateral (2.5 cm), and basal (2.3 cm) with right atrial collapse and right ventricle with mitral-tricuspid respirophasic 43%.

Figure 2. Echocardiography show massive pericardial effusion in anterior, posterior, left lateral and basal

The next day pericardiocentesis was done. Pericardial fluid cytology, analysis, and culture was done, the fluid was exudative and no malignant cells was found. ADA test was normal (7.9 U/L). The GeneXpert pericardial fluid was negative. 400 mcg of levothyroxine every 24 hours was given and was continued 100 mcg next day.

On the eighteenth day, there were no symptoms and no pericardial effusion. The patient was discharged with 100 mcg of *levothyroxine*.

A month later, the patient came for routine follow up. Her laboratory tests were normal. Pericardial effusion was also absent. Levothroxine 100 mcg of was continued.

Discussion

Hypothyroidism can affect many organ systems with a wide variety of clinical symptoms. Effects on cardiovascular include abnormality of heart contractility, heart rate, conduction system, ventricle function, vascular resistance, and endothelial system, which makes hypothyroidism a predisposition factor for arrhythmia, heart failure, high blood pressure, and pericardial disease. [5]

The pathophysiology of pericardial effusion in hypothyroidism is increased vascular permeability, increase pericardial capillary permeability and decrease of albumin drainage into lymphatic vessels lead to the increase of pericardial colloid pressure and

decrease the colloid osmotic pressure gradient between pericardium and its cavity, thus lead to accumulation of fluid in pericardial cavity. Increased permeability of albumin is related to histamine release induced by low level of thyroid hormones or direct effect to endothelial layer of pericardial capillary vessels. Disruption of lymphatic drainage may be caused by pulmonary hypertension induced by hypothyroidism and the increase pressure of right ventricle. Decrease of catecholamine in the circulation induced by hypothyroidism, also presumed to play a role. [2, 3] Cardiac tamponade caused by hypothyroidism is rarely happens, but are reported on severe hypothyroidism cases or myxedema. (6-8)

Clinical manifestation of pericardial effusion in hypothyroidism are mostly asymptomatic. Classical symptoms are dyspnea especially with activities which develops to orthopnea, chest pain, or fullness in chest. Other physical examination may be normal, except the presence of hemodynamic disturbances in cardiac tamponade. [1, 9]

Hypothyroidism is a condition decrease in production of thyroid hormone or disruption of thyroid hormone effects on target tissue. [10, 11] Hypothyroidism can be suspected as a cause for pericardial effusion or cardiac tamponade after ruling out other secondary causes [1, 9]

In hypothyroid patients with pericardial effusion, heart rate is significantly lower compared to euthyroid patients. [12] Therefore, hypothyroidism should be considered in cases of cardiac tamponade without the presence of tachycardia. Low voltage is found on 42-50% of patients.[2] T-wave flattening and inversion are also commonly found. [3, 12]

Pericardial fluid in most cases of hypothyroidism is exudative. However, diagnostic pericardiocentesis mostly not necessary. Diagnostic pericardiocentesis is important to be done if there is a strong suspicion in bacterial infection or malignancy. [1, 3, 13, 14]

An important management is treating the cause. Levothyroxine is the drug of choice. Levothyroxine should be started at 1.6 µg/kg in overt hypothyroidism with TSH > 10 uU/mL and lower dose (25–50 µg every day) if TSH level 5-10 uU/mL. TSH levels should be checked every 4-6 weeks and levothyroxine dose may be adjusted 12.5–25 µg every day if needed. This is done until TSH reaches normal levels (0.4–4.0 mIU/L). If the target has been reached, TSH should be reevaluated 4-6 months after, and then every year if TSH remains on target. [3, 15]

Thyroid hormone therapy without pericardiocentesis can be done in several cases of cardiac tamponade caused by hypothyroidism with hemodynamically stable [12] The use of levothyroxine in acute cases like in pericardial effusion, pericarditis, or other acute diseases, dosage modification should be done. [3] Around 80% cases of massive pericardial effusion and cardiac tamponade occur in severe hypothyroidism or myxedema. On myxedema cases, levothyroxine can be started with initial dose 200-400 µg given through intravenous bolus or NGT, followed by oral dose of 1.6 µg/kg/day, decreased by 25% if given intravenously. [11, 16] In some case reports, initial dose is varied, starting from 25mcg/day to 400 mcg/day, depending on thyroid function examination results and other presenting comorbidities. [17-20]

Conclusion

Cardiac tamponade in patient with hypothyroid is rare condition. Pericardial effusion induced by hypothyroidism are often underdiagnosed. Early detection of hypothyroid symptoms and prompt treatment can prevent complication. Its management consists of hormone replacement therapy and pericardial drainage in case tamponade happen.

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References

1. Adler Y, Charron P, Imazio M, Badano L, Barón-Esquivias G, Bogaert J, et al. 2015 ESC Guidelines for the diagnosis and management of pericardial diseases: the Task Force for the Diagnosis and Management of Pericardial Diseases of the European Society of Cardiology (ESC) Endorsed by: The European Association for Cardio-Thoracic Surgery (EACTS). J European heart journal. 2015;36(42):2921-64.
2. Yamanaka S, Kumon Y, Matsumura Y, Kamioka M, Takeuchi H, Sugiura T. Link between pericardial effusion and attenuation of QRS voltage in patients with hypothyroidism. J Cardiology. 2010;116(1):32-6.
3. Chahine J, Ala CK, Gentry JL, Pantalone KM, Klein AL. Pericardial diseases in patients with hypothyroidism. J Heart. 2019;105(13):1027-33.
4. Coetzee A, Kyriakakis C, Greyling C, Ascott-Evans. Cardiac tamponade due to hypothyroidism: a case cluster report. J Journal of Endocrinology, Metabolism, Diabetes of South Africa,2016;21(2):16-9.
5. Klein I, Danzi S. Thyroid disease and the heart. J Circulation. 2007;116(15):1725-35.
6. Chiu MH, Sharma NC. A case of hypertensive emergency, primary hypothyroidism and large pericardial effusion with early tamponade. Journal of cardiology cases. 2018;18 (1)(1):29-32.
7. Rawat B, Satyal A. An echocardiographic study of cardiac changes in hypothyroidism and the response to treatment. J Kathmandu University medical journal. 2004;2(3):182-7.
8. Kurtzman RS, Otto DL, Chepey JJ. Myxedema heart disease. J Radiology. 1965;84 (4)(4):624-30.
9. Lilly LS. DIseases of the Pericardium. In: Lilly LS, editor. Pathophysiology of Heart Disease. 6 ed. Philadelphia: Wolters Kluwer; 2016. p. 334-49.
10. Ladenson P. Diagnosis Of Hypothyroidism. In: Lewis E. Braverman, Cooper DS, editors. Werner& lngbar's the thyroid: a fundamental and clinical text. Philadelphia: Lippincott Willlams & Wilkins; 2013. p. 606-11.
11. Jameson JL, Mandel SJ, Weetman AP. Hypothyroidism. In: Jameson JL, Fauci A, Kasper D, HAuser S, Longo D, loscalzo J, editors. Harrison's Manual of Medicine. 20 ed. New York: McGraw-Hill Education; 2019. p. 1-16.
12. Wang J-L, Hsieh M-J, Lee C-H, Chen C-C, Hsieh I-C, Lin F-C, et al. Hypothyroid cardiac tamponade: clinical features, electrocardiography, pericardial fluid and management. J The American journal of the medical sciences. 2010;340(4):276-81.
13. Verhaert D, Gabriel RS, Johnston D, Lytle BW, Desai MY, Klein AL. The role of multimodality imaging in the management of pericardial disease. J Circulation: Cardiovascular Imaging. 2010;3(3):333-43.
14. Klein AL, Abbara S, Agler DA, Appleton CP, Asher CR, Hoit B, et al. American Society of Echocardiography clinical recommendations for multimodality cardiovascular imaging of patients with pericardial disease: endorsed by the Society for Cardiovascular Magnetic Resonance and Society of Cardiovascular Computed Tomography. J Journal of the American Society of Echocardiography. 2013;26(9):965-1012. e15.
15. Jonklaas J, Bianco AC, Bauer AJ, Burman KD, Cappola AR, Celi FS, et al. Guidelines for the treatment of hypothyroidism: prepared by the american thyroid association task force on thyroid hormone replacement. J Thyroid. 2014;24(12):1670-751.
16. Surani SR, Garcia RO, Modak A. Hypothyroidism Induced Cardiac Tamponade in Intensive Care Unit—A Rare Presentation. J Crit Care.

2006;9(2):52.

17. Apaydin M, Beysel S, Demirci T, Caliskan M, Kizilgul M, Ozcelik O, et al. A case of primary hypothyroidism initially presenting with massive pericardial effusion. J Journal of Clinical Translational Endocrinology: Case Reports. 2016;2:1-2.
18. Bahrani S, Emami SA, Vakhshoori M, Siavash M, Kiani K, Mahmoudi F. Primary Hypothyroidism Leading to Massive Pericardial Effusion and Diastolic Right Ventricular Compression: a Case Report. J SN Comprehensive Clinical Medicine. 2019:1-4.
19. Gopalaraju MA, Wesly K. Cardiac Tamponade: Rare presentation of Hypothyroidism. Journal of Case Reports. 2016;6(2):268-72.
20. Reddy K, Mudgalkar N, prasad LSr. A rare case of hypothyroidism presenting as massive pericardial effusion with cardiac tamponade. Perspectives in medical research. 2015;3(2):27-8.