Original Research Article

ECG and X-ray findings in pericardial effusion in adult hypothyroid patients

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Abstract

Introduction: Pericardial effusions can be caused by multiple disease states, including any process that results in pericarditis or myocarditis. The inflammatory reaction in these disease states can result in fluid accumulation in the pericardial space. Systemic manifestations of hypothyroidism can significantly vary according to the thyroid function, the presence of associated diseases and the duration of autoimmunity. Long-term overt hypothyroidism significantly affects growth as well as heart, liver, skin, and kidney functions, causing signs and symptoms that promptly lead to its diagnosis.

The aim of the study: To analyze the important diagnostic tool ECG and X-ray finding among diagnosed pericardial effusion adult hypothyroid patients.

Materials and methods: The study was conducted in 2017. Patients attending the Outpatient Clinic of the Department of Endocrinology who satisfied the inclusion criteria were registered for the study after obtaining their consent. A detailed questionnaire was used to elicit symptoms of hypothyroidism. ECG and x-ray findings were predicted accordingly.

Results: Low voltage complexes were found in 17 patients (24.29%), sinus bradycardia was found in 6 patients (0.09%), the poor progression of R waves in 3 patients (0.04%). The remaining 44 patients had a normal ECG. Chest films showed Mild cardiomegaly in 20 patients (28.57%). 11 of these 20 patients had pericardial effusion on echocardiography. One patient with echo proven pericardial effusion had normal chest X-ray. So chest X-rays can be used to look for clues for pericardial effusion.

Conclusion: Clinical features of pericardial effusion show statistically significant association with its presence on echocardiogram. ECG and CXR can be used to predict the presence of a Pericardial Effusion.

Key words

Pericardial Effusion, Hypothyroidism, X-Ray, ECG.

Introduction

Thyroid hormones mediate growth and development of skeleton through its direct effects, as well as through permissive effects on growth hormone. The classic findings of hypothyroidism in bone are all described in congenital hypothyroidism, where the thyroid hormone is inadequate before the formation of the epiphysis [1]. But, the effects of low thyroid hormone levels on a growing skeleton, after formation of epiphysis is less defined, and the data on these findings are scarce. Due to the popularity of congenital hypothyroidism screening programs, the untreated congenital hypothyroid patient is a rarity [2]. But the entity of juvenile hypothyroidism, where thyroid hormone becomes inadequate in childhood or adolescence after the brain development is complete, is being recognized off late. Early autoimmune destruction of the thyroid gland is the commonest cause. Electrocardiographic changes include sinus bradycardia, prolongation of the PR interval, low amplitude of P wave and QRS complex, alterations of the ST segment and flattened or inverted T waves in hypothyroidism [3]. Pericardial effusion is probably responsible in part for ECG changes. Rarely complete heart block may be present. But this disappears when hypothyroidism is treated. But this disappears when hypothyroidism is treated [4]. The systolic time interval is altered, the pre-ejection period is prolonged and the ratio of the pre-ejection period to left ventricular ejection time is increased. Pericardial effusions are best diagnosed by echocardiography, which is validated to estimate the size and location, and determine if a hemodynamic compromise is present causing cardiac tamponade. Right ventricular diastolic collapse would indicate cardiac tamponade. The chest X-ray shows a markedly enlarged cardiac silhouette termed "water-bottle heart." Chest X-ray will show a “globular heart” with significant heart enlargement [5].

Materials and methods

The study was conducted in 2017 with 70 Patients attending the Outpatient Clinic of the Department of Endocrinology who satisfied the inclusion criteria were registered for the study after obtaining their consent. A detailed questionnaire was used to elicit symptoms of hypothyroidism. The patient was examined to look for a sign of hypothyroidism. Special attention was given to the examination of the cardiovascular system to look for clinical features of pericardial effusion.

Inclusion criteria

- Newly diagnosed patients with elevated TSH and decreased T3 and T4.
- Age of the patients more than 18 years.

Exclusion criteria

- Patients already on treatment with Thyroxine.
- Patients with other known causes of pericardial effusion – tuberculosis, uremia malignancy, irradiation, connective tissue disorders, acute febrile onset, trauma, myocardial infarction and cardiac surgery.

An ECG, Chest X-ray and an Echocardiogram were obtained for all the patients. The data were statistically analyzed using SPSS 2017 software.

Results

The age distribution of the patients ranged between 18 years and 60 years with a mean age of 33.97 years. Overweight was a common finding on clinical examination, which was present in 64 % of patients. The mean pulse rate

was 80 / min and mean blood pressure 110 / 70 mm of Hg. Pallor was present in 50 % of patients. Clinically indistinct heart sounds and cardiomegaly was present 28 % and 10 % of patients respectively. Delayed deep tendon reflex was noticed in 37 % patients. Macroglossia was observed in 30 % of patients. None of these patients had pulses paradoxus or features suggestive of cardiac failure. The signs of hypothyroidism elicited in the study group were as per **Table - 1**.

Table – 1: Clinical signs among patients.

Sign	No. of patients	%
Goiter	6	9
Weight Gain	45	64
Pallor	35	50
Macroglossia	21	30
Cardiomegaly	7	10
Distant Heart Sounds	20	28
Slow Relaxation Of DTR	26	37
Galactorrhoea	12	8

This clinical feature was found in 21 patients of hypothyroidism. 5 of these patients developed pericardial effusion (23.8%), while among the 49 patients without macroglossia pericardial effusion was found in 7 patients (14.28%). On statistically analyzing the data we find that there was a significant association between the presence of macroglossia and pericardial effusion (P<0.001) as per **Table – 2**.

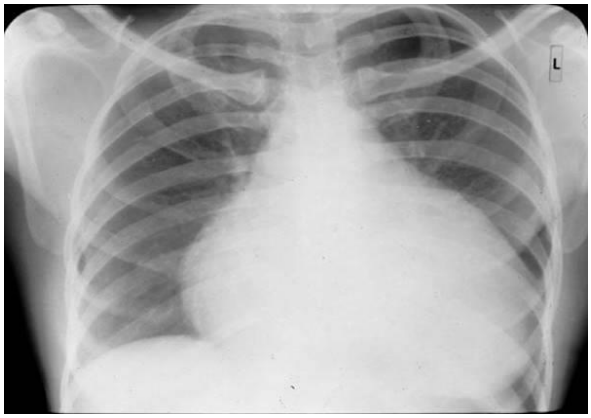
Table - 3: Macroglossia among patients.

	Macroglossia	No Macroglossia	P value
PE	5	7	<0.001
No PE	17	42	

Low voltage complexes were found in 17 patients (24.29%), sinus bradycardia was found in 6 patients (0.09%), the poor progression of R waves in 3 patients (0.04%). The remaining 44 patients had a normal ECG. Among the 26 patients with ECG changes, the echo showed pericardial effusion in 12 patients (46.15 %). While none of the 44 patients with Normal ECG showed pericardial effusion. So ECG can be used as a screening tool to predict pericardial effusion. Among the patients with pericardial effusion, ECG changes were found in all 100%.

Chest films **(Figure – 1)** showed Mild cardiomegaly in 20 patients (28.57%). 11 of these 20 patients had pericardial effusion on echocardiography. One patient with echo proven pericardial effusion had normal chest X-ray. So, chest X- rays can be used to look for clues for pericardial effusion.

Figure – 1: Mild cardiomegaly.



Discussion

When thyroid hormone is absent from birth, it leads to growth arrest, delayed bone age, and short stature. Ossification centers are defective, and they appear in an irregular and mottled pattern, with multiple foci that coalesce to give a porous or fragmented appearance known as stippled epiphyseal dysgenesis, most frequently noted in large cartilaginous centers, such as the head of the femur, head of the humerus and the tarsal navicular bone [6]. When hypothyroidism is acquired during the growing ages, as in juvenile hypothyroidism, the manifestations are different. Skeletal maturation, defined as the appearance of secondary centers of ossification, is predominantly affected, with a delayed fusion of epiphysis, and delayed bone age [7]. The epiphyseal centers are heterogeneous with irregular ossification. But the classical stippled epiphyseal dysgenesis, described with congenital hypothyroidism, does not occur. Changes in the upper lumbar vertebrae result in wedge-shaped

anterior margins and may lead to spondylolisthesis [8]. The metaphyseal end of long bones usually has a sclerotic band. Juvenile hypothyroidism decreases the activity of chondrocytes, osteoblastic cells as well as osteoclasts. Despite the decrease in osteoblastic activity, trabecular bone volume and bone mineral density appear to be normal or slightly altered, because of the reduction in osteoclastic activity. In patients with pericardial effusion, the expected ECG changes are – low voltage complexes and poor progression of R waves [9]. A chest x-ray can help in diagnosing pericardial effusion by revealing cardiomegaly. In this study, we analyzed the prevalence of pericardial effusion in those with ECG and Chest X-ray changes suggestive of its existence. There was found to be a significant correlation between ECG changes and pericardial effusion [10]. Sinus bradycardia was found more commonly in patients with severe hypothyroidism. Chest X-ray was also found to reliably predict the presence of underlying PE. Available description of hypothyroid associated pericardial effusion suggests that patients present far more commonly with signs and symptoms of the underlying endocrine disorder than with the sequelae of pericardial effusion. In this study, 71% of the patients complained of generalized myalgia and lethargy [11], Other symptoms of hypothyroidism were found less commonly. But symptoms suggesting the involvement of cardiovascular systems like dyspnea on exertion and chest pain were found in only 14% of the patients. Similarly, signs of pericardial effusion like muffled heart sounds and cardiomegaly were found only in 28% while signs of hypothyroidism like weight gain and pedal edema were found in around 64% of the patients [12]. When analyzed statistically we did find a significant association between the presence of signs/symptoms and occurrence of pericardial effusion. In this study group, macroglossia was found in around 30% of the patients. Macroglossia has been described as a clinical feature of hypothyroidism and it has been proposed that it is caused by the accumulation of fluid in the tongue. Nicola Meares, Stanky Braude M, et al. described a case of 'Massive macroglossia as a presenting feature of Hypothyroid-associated pericardial effusion' [13]. In this case, drainage of pericardial effusion resulted in prompt resolution of macroglossia. They argued that the macroglossia could have been a direct consequence of the effusion which could have led to venous engorgement [14]. Among the 21 patients with macroglossia five patients had pericardial effusion and on statistically comparing it with patients without macroglossia it was found that this sign was more commonly present in patients with pericardial effusion [15].

Conclusion

Age and sex of the patient were not found to be risk factors for the development of pericardial effusion among patients with hypothyroidism. Clinical features of pericardial effusion show statistically significant association with its presence on echocardiogram. Macroglossia was more commonly found in patients with Pericardial Effusion. ECG and CXR can be used to predict the presence of a Pericardial Effusion. When serum thyroid hormone levels are used as a marker of severity, pericardial effusion is found more commonly in patients with the more severe disease.

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