Section: General Medicine

Original Research Article

A HOSPITAL BASED PROSPECTIVE STUDY TO FIND OUT A CORRELATION BETWEEN SEVERITY OF DISEASE AND PRESENCE OF PERICARDIAL EFFUSION IN ADULT HYPOTHYROID PATIENTS AT TERTIARY CARE CENTER

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Abstract

Background: The purpose of the present study is to enlighten the already established association and to observe the incidence and severity of pericardial effusion, its relation to duration and severity of hypothyroidism. **Materials and Methods:** This is a hospital based prospective study done on 50 patients attending the Outpatient Clinic of the Department of Medicine who satisfied the inclusion criteria were registered for the study after obtaining their consent. The patients were examined for signs of hypothyroidism. Special attention was given to the examination of the cardiovascular system to look for clinical features of pericardial effusion. Sensitive and specific methods for the determination of free and total concentration of blood are now available. These methods are the radio- immunoassay, florescent immunoassay and the enzyme linked immunoassay. **Result:** Pericardial effusion was noted in (N=9) 18 % of patients by 2D echo. It was always mild (on average anteriorly 0.5 cm and posteriorly 0.4 cm) to moderate (anteriorly 0.7 cm and posteriorly 1.9 cm). Mild effusion was present in 88.88 % of patients. The average age of those with PE is 34.42yrs and that for those without PE is 34.24 yrs. No statistical significance was observed between age of the patient and occurrence of Pericardial Effusion. No statistically significant association was found between gender of the patient and pericardial effusion (P=0.93). It was seen that mean serum TSH was statistically higher in patients who were found to have pericardial effusion than in the control group. **Conclusion:** Hypothyroidism-induced pericardial diseases are underdiagnosed. Initiating treatment early in the disease process and preventing complications relies on early diagnosis through systematic screening per guidelines.

INTRODUCTION

Hypothyroidism is a common endocrine disorder resulting from deficiency of thyroid hormone. It usually is a primary process in which the thyroid gland produces insufficient amounts of thyroid hormone.[1] It can also be secondary, that is lack of thyroid hormone secretion due to the failure of either adequate thyroid-stimulating hormone [TSH]) secretion from the pituitary gland or thyrotropin-releasing hormone (TRH) from the hypothalamus (secondary or tertiary hypothyroidism). The most common cause is autoimmune thyroid disease (Hashimoto thyroiditis).[1] According to a survey by Jayarama, K. S. et al the prevalence of hypothyroidism in India is 0.071%.[2]

Although association of pericardial effusion with Hypothyroidism is a known entity for many decades, various studies report varying incidences. The purpose of the present study is to enlighten the already established association and to observe the incidence and severity of pericardial effusion, its relation to duration and severity of hypothyroidism. The unique feature of "Hypothyroid" pericardial effusion is that unlike, other exudative effusion, it disappears with medical treatment without any residual sequelae. The terms Myxoedema and hypothyroidism are often used interchangeably. But the latter is more inclusive, encompassing all degrees of hypo metabolism from normal to complete

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atherosis. Myxedema is a particular syndrome, a florid hypothyroidism occupying the lower end of this spectrum. The first known description of pericardial effusion in a hypothyroid patient dates back to 1918. Since then, several publications have reported on the association between hypothyroidism and pericardial effusion, and even other serous effusions. Pericardial effusion is considered the most frequent cardiovascular complication of hypothyroidism, with a prevalence estimated to be between 30% and 80%.

Pericardial effusion (PE) may be a frequent manifestation in myxoedema, an advanced severe stage, as previously found, but is rarely associated with mild hypothyroidism.[3] Since then, several publications have reported on the association between hypothyroidism and pericardial effusion, and even other serous effusions. The recent studies concluded that PE is extremely infrequent in hypothyroidism, with an incidence of 3% to 6%.[4] To our knowledge, about 20 cases of hypothyroid with cardiac tamponade have been reported in the literature. Cardiac tamponade is usually a consequence of increased pericardial pressure with an accumulation of pericardial effusion. Pericardial effusion may be caused by acute pericarditis, tumor, uremia, hypothyroidism, trauma, cardiac surgery, or other inflammatory/ noninflammatory conditions.[5]

A small pericardial effusion can cause clinically significant cardiac tamponade when it accumulates rapidly. It is important to suspect cardiac tamponade when patients have hemodynamic compromise regardless of the amount of pericardial effusion. Here we report an uncommon case of hypothyroidism with cardiac tamponade.[6] The aim of this study to find out a correlation between severity of disease and presence of pericardial effusion in adult hypothyroid patients at tertiary care center.

MATERIALS AND METHODS

This is a hospital based prospective study done on 50 patients attending the Outpatient Clinic of the Department of Medicine 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 patients were examined for signs 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.

Serum hormone concentration: Sensitive and specific methods for the determination of free and total concentration of blood are now available. These methods are the radio- immunoassay, florescent immunoassay and the enzyme linked immunoassay.

Serum Total T4 concentration:[7]

The normal range of total T4 concentration in healthy adults is between 4.5-10.9 µg/dl with variation in normal range between laboratories.

Serum Total T3 concentration:[7]

The normal range of total T3 concentration in healthy adults in 60-181 ng/dl with the variation between different laboratories.

Serum thyroid stimulating hormone (TSH) concentration:[7]

The normal range of TSH concentrations in adults vary between 0.5 -4.70 µunits/ml. This is measured by the radio – immunoassay method. It is an extremely useful measurement in the diagnosis and management of hypothyroidism.

Methods: Blood was drawn for complete hemogram, lipid profile, and thyroid profile and sent to the Biochemistry Laboratory. An ECG, Chest X-ray and an Echocardiogram were obtained for all the patient's data were statistically analyzed using SPSS 2017 software.

RESULTS

Pericardial effusion was noted in (N=9) 18 % of patients by 2D echo. It was always mild (on average anteriorly 0.5 cm and posteriorly 0.4 cm) to moderate (anteriorly 0.7 cm and posteriorly 1.9 cm). Mild effusion was present in 88.88 % of patients. Moderate effusion was present in only one patient. Severe pericardial effusion or cardiac Tamponade was never observed. Left ventricular dysfunction in the form of global hypokinesia & reduced ejection fraction was present in one patient. In another patient mild pericardial effusion was associated with mild septal hypertrophy and mild global hyperkinesia leading to mild left ventricular dysfunction. None of these patients had evidence of pericardial thickening. The average age of those with PE is 34.42yrs and that for those without PE is 34.24 yrs. No statistical significance was observed between age of the patient and occurrence of Pericardial Effusion. No statistically significant association was found between gender of the patient and pericardial effusion (P=0.93) [Table 1].

Only one of the 9 patients with pericardial effusion had cardiovascular symptoms like chest pain and breathlessness. 8 patients without PE still did complain of chest pain and/or dyspnea. On statistically analyzing we see that cardiovascular symptoms not significantly associated with pericardial effusion (P<0.05) [Table 1].

Clinical signs of PE like distant heart sounds and/or cardiomegaly on percussion were found in 2 patients among those with PE as documented on echo. But these signs were also found in 14 among the patients without PE. On statistically analyzing the data we

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find that there is a significant association between presence of signs of effusion and its documentation on echo.

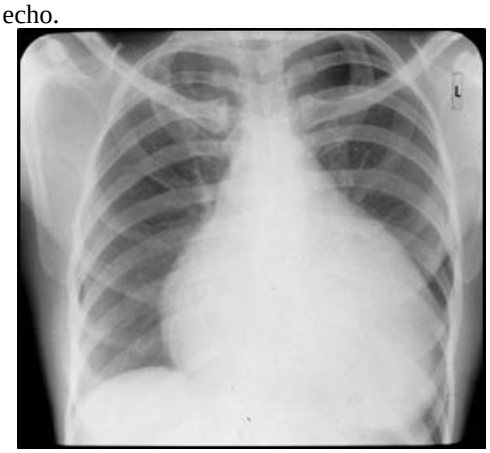

Figure 1: Chest x-ray

Chest films showed Mild cardiomegaly in 14 patients (28%). 9 of these 14 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].

The mean serum TSH, T3 and T4 were compared between patients with pericardial effusion and those without. It was seen that mean serum TSH was statistically higher in patients who were found to have pericardial effusion than in the control group. A similar association was also found between low mean serum T4 and Pericardial Effusion but no association was documented between low mean serum T3 and presence of pericardial effusion [Table 1].

Table 1: Demographic and clinical variables in with or without pericardial effusion patients.

Variables	PE (N=9)	No PE (N=41)	P value
Age (yrs)	33.78±5.23	34.56±5.12	>0.05
	Gender		
Male	1	3	>0.05
Female	8	38	
	Symptoms		
Symptomatic	1	9	<0.05*
Asymptomatic	8	32	
	Signs		
Present	2	14	<0.05*
Absent	7	27	
TSH (Mean±SD)	40.78±11.26	26.42±4.89	<0.05*
T3 (Mean±SD)	87.54±18.82	92.23±7.16	>0.05
T4 (Mean±SD)	4.12±0.69	6.83±0.78	>0.05

DISCUSSION

Hypothyroidism, a disease with a multisystem involvement that may present clinically in various forms, one being unusual pericardial effusion, a cardiovascular complication. Early studies of overtly hypothyroid patients suggested that pericardial effusion was a relatively common phenomenon.[8,9] More recent echocardiographic studies of the hypothyroid population show a widely varying incidence of pericardial effusion from 3 to 88 %.

In our study 18% of the hypothyroid patients were found to have pericardial effusion on Echocardiography. Mancuso L, Lo Bartolo G, Iacona MA et al studied 25 patients with primary hypothyroidism using M-Mode and 2 D Echo and reported the incidence of pericardial effusion to be 88%.[10] According to Kabadi U.M. & Kumar S.P. et al,[11] the incidence of pericardial effusion was 30 – 80 % in full blown of hypothyroids. However, these earlier studies were conducted when the diagnosis of hypothyroidism was only suspected and was confirmed only in the presence of classic clinical features. In contrast, the diagnosis has recently been established in the early mild stage or more often in an asymptomatic stage because of more frequent or routine determinations of thyroid function tests, especially in the elderly. Thus, the subjects in the older studies were severely hypothyroid at the time of diagnosis and may not be representative of the present hypothyroid population. Due to earlier detection, the incidence has now fallen to 3% – 6%.

Gunderson et al,[12] studied 20 patients with hypothyroid cardiomyopathy. Pericardial effusion was demonstrated in 15 of the patients which disappeared with thyroxin therapy.

The mean age of the patients studied was 33.46 yrs and most of the patients were found between the age group of 18 and 44 years. Literature review showed that the mean age at diagnosis of auto immune thyroiditis is 60 years and the prevalence of hypothyroidism is said to increase with age. But this pattern was not observed in our study group, probably due the relatively small number of cases studied. On analyzing the mean age between patients with pericardial effusion and those without, no significant difference was found. So, it has been concluded that age of the patient does not play a role in incidence of pericardial effusion.

The male: female ratio in this study has been found to be 1:13. Community studies use slightly different criteria for determining hypothyroidism; therefore, female-to-male ratios vary. Generally, thyroid disease is much more common in females than in males, with reports of prevalence 2-8 times higher in females.[13] We compared the prevalence of pericardial effusion among male and female hypothyroids and we found that there was no

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significant association between sex of the patient and incidence of pericardial effusion.

Available description of hypothyroid associated pericardial effusion suggest that patients present far more commonly with signs and symptoms of the underlying endocrine disorder than with the sequelae of pericardial effusion.[14]

Pericardial effusion was reported in early studies in 30 -80% of subjects with hypothyroidism. However, these earlier studies were conducted when the diagnosis of hypothyroidism was made by classic clinical features. In contrast, the diagnosis has recently been established in the early mild stage or in an asymptomatic stage because of the frequent use of highly sensitive thyroid function tests. Moreover, the occurrence of pericardial effusion in hypothyroidism appears to be dependent on the severity of the disease. Thus, a large pericardial effusion may be a frequent manifestation in myxoedema, but a rare association of hypothyroidism in early mild stage.[15] But in studies done by Kabadi et al,[16] and Yamamato et al,[17] it has been demonstrated that no correlation exists between duration or severity of hypothyroidism and incidence of pericardial effusion. In our study we compared mean Serum T3, Serum T4 and Serum TSH levels between the patients with pericardial effusion and those without effusion. Mean TSH in patients with Pericardial effusion was 40.78 while that of patients without it was 26.42. Mean serum T4 in patients with pericardial effusion was 4.12 and mean serum T4 in the control group was 6.83. It was seen that high serum TSH and low Serum T4 were statistically associated with occurrence of Pericardial effusion($p<0.05$*). So we conclude that pericardial effusion is more commonly found in patients with severe hypothyroidism.

But symptoms suggesting involvement of cardiovascular system 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 was found in around 64% of the patients. When analysed statistically we did find a significant association between presence of signs/symptoms and occurrence of pericardial effusion.

CONCLUSION

Hypothyroidism-induced pericardial diseases are underdiagnosed. Initiating treatment early in the disease process and preventing complications relies on early diagnosis through systematic screening per guidelines.

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