

ORIGINAL RESEARCH

## STUDY OF CAROTID INTIMA MEDIA THICKNESS (CIMT) IN PATIENTS OF SUBCLINICAL HYPOTHYROIDISM (SCH)

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### ABSTRACT

**BACKGROUND:** Subclinical hypothyroidism (SCH) is defined as an elevated serum thyroid-stimulating hormone (TSH) level with a normal serum free tri-iodothyronine (FT3) & free thyroxine (FT4) concentration. Hypothyroidism is associated with an increased risk of atherosclerosis. SCH can progress to overt hypothyroidism. Carotid intima-media thickness (CIMT) is a close marker of early atherosclerotic changes and is a widely accepted surrogate end point for cardiovascular events.

**AIMS AND OBJECTIVES:** To study the CIMT in patients with SCH.

### MATERIAL & METHODS:

35 individuals with newly diagnosed / untreated SCH were studied. 35 age and sex matched adults with normal thyroid profile were taken as controls. Serum TSH, FT3, FT4, and CIMT were measured in all study subjects.

**RESULTS:** There was a statistically significant increase in CIMT on both sides.

**CONCLUSION:** SCH is associated with an increase in CIMT, which is a marker of atherosclerosis, with a resultant risk of cardiovascular disease and stroke. Thus, it is important to detect this condition early so that appropriate steps may be taken to prevent its deadly complications.

**KEYWORDS:** Subclinical hypothyroidism; Atherosclerosis; CIMT;

### INTRODUCTION

Subclinical hypothyroidism (SCH) is defined as an elevated serum TSH level with a normal serum free tri-iodothyronine (FT3) & free thyroxine (FT4) concentration.<sup>1, 2</sup> Overt or frank hypothyroidism is a well-established entity since many years. With the advent of widespread

TSH screening and improved efficiency of the testing equipments the magnitude of subclinical thyroid disease may exceed that of overt disease by three to fourfold in recent years. The prevalence has been reported to range from 6-8% in women and 3% in men (up to 10% in women more than 60 years).<sup>3, 4</sup> Other terms previously used for subclinical hypothyroidism are mild hypothyroidism, early thyroid failure, preclinical hypothyroidism, and decreased thyroid reserve.

The upper and lower limits of the normal serum TSH concentration continue to be debated by expert clinical thyroidologists. The normal range of the serum TSH concentration by immunometric assay is most commonly 0.4 to 4.2  $\mu$ IU/mL. Subclinical hypothyroidism is said to be essentially a biochemistry or a laboratory diagnosis and may or may not be associated with clinical features of hypothyroidism.

Hypothyroidism is known to be associated with atherosclerosis and ischemic heart disease. The accelerated atherosclerosis in hypothyroid state has been traditionally ascribed to atherogenic lipid profile, diastolic hypertension and impaired endothelial function. Patients with SCH have a high rate of progression to clinically overt hypothyroidism. SCH may progress to overt hypothyroidism in approximately 2-5% cases annually and produce adverse clinical consequences.<sup>5</sup> It is expected that SCH may also be associated with early vascular atherosclerosis and so needs to be recognized and treated early.

The first structural change that can be detected in atherosclerosis is an increase in intima media thickness. Carotid intima-media thickness (CIMT) is a close marker of early atherosclerotic changes and is a widely accepted surrogate end point for cardiovascular events. It is suggested to be an important biomarker of subclinical atherosclerosis.

Examination of the carotid wall by B-mode ultrasonography is a non-invasive, safe, easily performed, reproducible, sensitive, relatively inexpensive and widely available method for detection of early stages of IMT and thus atherosclerosis. The test measures the thickness of the inner two layers of the carotid artery—the intima and media—and alerts physicians to any thickening when patients are still asymptomatic. CIMT is measured in B-mode ultrasound images of the carotid tree as a typical double line of the arterial wall. (Fig 1) It is best visible in the measurement segment of the distal common carotid artery with lowest measurement variability.

IMT is defined as a double-line pattern on both walls of the common carotid artery (CCA) in a longitudinal view. The normal intima-medial thickness of common carotid artery as evaluated by B-mode ultrasound imaging is  $0.74 \pm 0.14$  mm.<sup>6</sup> Damage is defined as the presence of IMT  $>0.8$  mm.<sup>7</sup>



Fig 1

#### AIMS AND OBJECTIVES

1. To measure carotid artery intima-media thickness in patients of SCH
2. and Correlate it with TSH level

#### MATERIAL & METHODS

35 patients with subclinical hypothyroidism and 35 healthy age & sex matched controls were taken in this study. Patients included were those who attended the Outpatient and indoor of a

tertiary hospital for regular health check-up and/or peoples with features suggestive of hypothyroidism. The first group included 35 individuals with subclinical hypothyroidism who were newly diagnosed and untreated and ranged in age from 18 to 60 years old. The controls were a group of 35 healthy adults of similar age and sex who had a normal thyroid profile.

All subjects were examined in the supine position with the head slightly elevated. The common carotid artery was scanned longitudinally to visualise the I-M complex at 1 cm proximal to the carotid artery bifurcation. The IMT is measured as a distance from the leading edge of the 1st echogenic line to the 2nd echogenic line. The 1st echogenic line represents the luminal intimal interface and the second line is produced by the collagen-containing upper layer of intimal adventitia. Carotid artery Intima-Media thickness recording was taken at 0.5-1 cm proximal to the bifurcation of the carotid artery.

The collected data was analysed by SPSS software. The proposed study was undertaken after the approval by the Institutional Ethical Committee.

### OBSERVATIONS AND RESULTS

The mean age and sex and BMI are shown in Table 1, Table 2 and Table 3 showing that they were age and sex matched.

#### MEAN AGE IN CASES AND CONTROLS

**Table no. 1**

|     | Cases      | Controls    |
|-----|------------|-------------|
| Age | 46.25±10.7 | 41.11±11.19 |

#### SEX DISTRIBUTION IN CASES AND CONTROLS

**Table no. 2**

|        | Cases | Controls | Cases  | Controls |
|--------|-------|----------|--------|----------|
| Male   | 6     | 8        | 17.14% | 22.85%   |
| Female | 29    | 27       | 82.85% | 77.14%   |

#### BODY MASS INDEX IN CASES AND CONTROLS GROUPS

**Table no. 3**

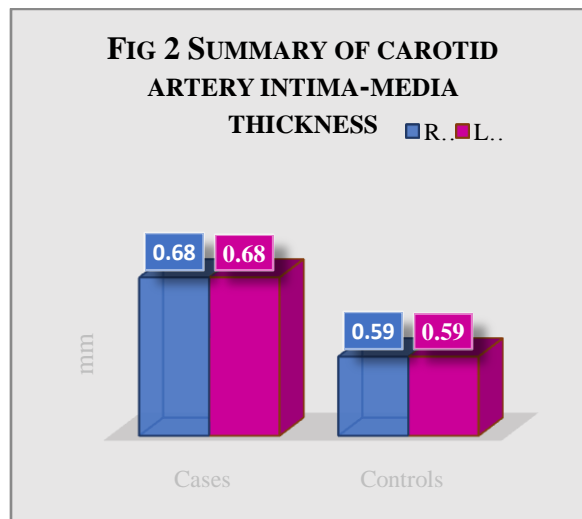
|     | Cases      | Controls   | P Value |
|-----|------------|------------|---------|
| BMI | 23.76±1.77 | 23.12±1.73 | 0.1321  |

**THYROID PROFILE IN CASES AND CONTROLS GROUPS****Table no. 4**

|              | Cases     | Controls  | P Value |
|--------------|-----------|-----------|---------|
| FT3 (pg/mL)  | 4.15±0.75 | 4.28±0.73 | 0.4928  |
| FT4 (ng/dL)  | 1.36±0.22 | 1.37±0.25 | 0.7993  |
| TSH (μIU/mL) | 5.71±1.30 | 2.27±0.89 | 0.0001  |

**CAROTID ARTERY INTIMA-MEDIA THICKNESS IN CASES AND CONTROLS****Table no. 5**

|        | Cases<br>(mm) | Controls<br>(mm) | P Value | Correlation<br>with TSH |
|--------|---------------|------------------|---------|-------------------------|
| R CIMT | 0.68±0.16     | 0.59±0.1         | 0.0065  | 0.0317                  |
| L CIMT | 0.68±0.14     | 0.59±0.0         | 0.0028  | 0.0702                  |



Changes in Right and Left CIMT are summarised in Fig 2

**DISCUSSION**

The mean CIMT on the right side was 0.68±0.16 mm in patients with subclinical hypothyroidism and 0.59±0.1 mm in euthyroid patients, which is statistically significant with a P value of 0.0065. Thus, the mean CIMT on the right side was significantly raised in the study group, which includes patients with subclinical hypothyroidism. In our study, carotid artery intima-media thickness on the right side was weakly correlated with serum TSH, with

a value of 0.0317. The mean CIMT on the left side was  $0.68 \pm 0.14$  mm in patients with subclinical hypothyroidism and  $0.59 \pm 0.09$  mm in euthyroid patients, which is statistically significant with a P value of 0.0028. Thus, the mean CIMT on the left side was significantly raised in the study group, which includes patients with subclinical hypothyroidism. In our study, carotid artery intima-media thickness on the left side was weakly correlated with serum TSH, with a value of 0.0702.

Thus, in our study we found a statistically significant increase in carotid artery intima-media thickness on both sides. Similar to our study, many other studies also showed statistically significant higher carotid artery media thickness. These studies include Kim et al.,<sup>8</sup> Adrees et al.,<sup>9</sup> Kanapp et al.,<sup>10</sup> Delitala et al.,<sup>11</sup> Gong et al.,<sup>12</sup> and Saric et al.<sup>13</sup> But a few studies showed that there was no significant increase in carotid artery intima-media thickness. These studies were those by Cabral et al.,<sup>14</sup> Miranda et al.<sup>15</sup>

## CONCLUSION

Subclinical hypothyroidism is an important condition which has been neglected and needs more attention as it may be associated with dyslipidemia with the resultant risk of atherosclerosis and cardiovascular disease. In the present study it was associated with a significant increase in Carotid intima Media thickness which is thought to signify atherosclerosis with increased risk of diseases like coronary artery disease & stroke. Thus, it is important to detect this condition early so that appropriate steps may be taken to prevent its deadly complications.

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