Carotid Intima-Media Thickness in Patients with Non-Alcoholic Fatty Liver Disease

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Abstract: Objective: To measure the thickness of Carotid Intima Media (CIMT) in patients with Non-Alcoholic Fatty Liver Disease (NAFLD) and compare it with Controls, to establish the strong association of NAFLD with increased CIMT.

Method/Setting: Fifty four patients with sonographically proven NAFLD and 50 controls were examined for CIMT. Carotid scanning was performed on Aloka 3500 Doppler Unit.

Results: The mean Intima Media Thickness in NAFLD group was 0.80±0.12 and in controls 0.58±0.15 (p= <0.0001). Carotid plaque was found in 24.07% patients in NAFLD group.

Conclusion: NAFLD as an independent risk factor for atherosclerosis and cardiovascular disease. Measurement of CIMT is a reliable, non-invasive tool for early detection of atherosclerosis in these patients.

Keywords: Non-Alcoholic Fatty Liver Disease (NAFLD), Carotid Intima Media Thickness (CIMT).

INTRODUCTION

Carotid Intima Media Thickness (CIMT) is a useful tool for detection of sub-clinical atherosclerosis. It therefore, not only indirectly indicates the presence of coronary atherosclerosis but also gives some estimation of its severity [1, 2].

Non-Alcoholic Fatty Liver Disease (NAFLD) is one of the most common liver diseases reported all over the world and the disease spectrum ranges from simple steatosis to non-alcoholic steato-hepatitis to cirrhosis [3]. Fatty liver, the common term used for NAFLD has strong association with metabolic syndrome. Obesity, type-2 diabetes, dyslipidemia and insulin resistance is therefore evident in most of these patients [4]. As there is a clear association of fatty liver disease being a part of spectrum of metabolic syndrome, several studies have been conducted to establish NAFLD as an independent risk factor for atherosclerosis and cardiovascular disease [4, 5].

The CIMT is considered to be a non-invasive marker for atherosclerosis and the thickness is directly proportional to the presence of atherosclerosis in the coronary vessels and the severity of cardiovascular disease [6, 7].

The aim of our study is to determine the relationship between NAFLD and CIMT by comparing the CIMT of patients with sonographically proven NAFLD with a group of patients having normal echogenicity of liver parenchyma on ultrasound.

MATERIALS & METHODS

Fifty patients with NAFLD confirmed on abdominal ultrasound and 50 controls with normal liver parenchyma underwent carotid artery ultrasonography for measurement of CIMT and detection of atherosclerotic plaque. All subjects aged between 40 and 50 years.

CIMT is defined as the distance between the leading edge of the first echogenic line (lumen-intima interface) and the second echogenic line (media-adventitia interface) of the anterior and posterior arterial walls.

Carotid plaque is defined as a focal thickening greater than 1.2 mm of the intima-media complex, measured from the media-adventitia interface to the intima-lumen interface. Carotid artery ultrasonography was performed using a 10 MHz high frequency linear transducer on the Aloka 3500 Doppler unit. Examination was performed in supine position with pillow under shoulders and neck tilted opposite to the site of examination to open up the anterior triangle of neck. Examination included sections of approximately 2-3 cm of common carotid artery just below the carotid bulb. After localizing the carotid arteries by transverse scan, a longitudinal image was obtained and recorded by rotating the probe. Thickness of Intima Media was measured vertical to the arterial wall. Three readings...
were recorded at each site and the average measurement was used. All the scans were performed by a single sonographer to maintain uniformity.

Hepatic Steatosis is defined as the presence of ultrasonographic pattern of parenchymal brightness of liver. It is graded as grade 1 to 3. Grading is as follows:

Grade 1 (mild): Minimally increased echogenicity with normal appearance of the diaphragm and intra-hepatic vessels.

Grade 2 (moderate): Moderately increased echogenicity with minimally altered appearance of diaphragm or intra-hepatic vessels.

Grade 3 (severe): Markedly increased echogenicity with poor visualization of diaphragm, intra-hepatic vessels and posterior portion of the right lobe. Complete loss of echogenicity of the wall of portal vein.

Patients with Diabetes mellitus, heart disease, hypertension, known dyslipidemias, history of chronic liver disease, hepatitis B or C virus infection, acute or chronic kidney disease, pregnancy or any malignancy were not included in the study. Cigarette smokers, alcoholics and those taking any medications like oral contraceptives were also excluded.

Data was analyzed on SPSS 20.0 and results were compared for the two groups.

RESULTS

We assessed 54 patients with NAFLD (33 males, 21 females) and 50 controls (28 males, 22 females). The mean patient age in NAFLD group was 47.5 years while it 46.7 years in the control group. Mean body mass index (BMI) of NAFLD group was higher as compared to the controls. In NAFLD group 14 (25.9%) had grade 3 hepatic steatosis while grade 1 and 2 hepatic steatosis was present in 12 (22.2%) and 28 (51.8%) patients respectively.

Mean CMIT in NAFLD group was 0.80±0.12 mm as compared to 0.58±0.15 mm in controls (p= <0.0001) (Table 1).

In NAFLD group majority (59.25%) of patients were hypertensive while in the control group 22% patients had history of hypertension.

The mean BMI in NAFLD group was 27.5 kg/m² while in control it was 26.0 kg/m².

![Figure 1: Sonographic appearance of Carotid Intima Media Thickness.](image)

DISCUSSION

Non-alcoholic fatty liver disease is a common disorder seen in clinical practice. Its strong association with metabolic syndrome and atherosclerosis has made it an interesting subject for research [8]. Increased CMIT is a reliable indicator of atherosclerosis burden and a good predictor of cardiovascular disease. In several clinical trials, The Intima Media Thickness was measured to determine the harmful effects of risk factors on vessel wall. Many researchers have proved that treating the risk factors

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>NAFLD</th>
<th>CONTROL</th>
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<tbody>
<tr>
<td>Total number of patients</td>
<td>54</td>
<td>50</td>
</tr>
<tr>
<td>Males</td>
<td>33</td>
<td>28</td>
</tr>
<tr>
<td>Females</td>
<td>21</td>
<td>22</td>
</tr>
<tr>
<td>Mean CMIT</td>
<td>0.80±0.12</td>
<td>0.58±0.15</td>
</tr>
<tr>
<td>Males</td>
<td>0.82±0.14</td>
<td>0.59±0.14</td>
</tr>
<tr>
<td>Females</td>
<td>0.79±0.16</td>
<td>0.57±0.13</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>27.5</td>
<td>26</td>
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</tbody>
</table>
decreases the progression of the IMT and there is a parallel reduction in cardiovascular risks and events [9, 10].

We measured the thickness of carotid intima media in patients with fatty liver on ultrasound. Previous many studies on the same topic also employed ultrasound as a reliable tool for the diagnosis of fatty liver [4, 11-13].

The prevalence of fatty liver disease increases progressively from normal weight subjects to obese subjects [14-16]. In our study also the average BMI in NAFLD group was 27.5 kg/m².

The mean CMIT in NAFLD group in our study was 0.80±0.12 while it was 0.58±0.15 in the control group (p= 0.0001). These values clearly show a strong relationship between hepatic steatosis and increased thickness of carotid intima media. The results are consistent with similar studies conducted earlier [11, 12, 16, 18].

Two studies explained the relationship between CIMT and NAFLD in type-2 diabetic patients with insulin resistance [13, 19].

In the present study, we could not prove the strong association of carotid plaque with NAFLD (24.07%). However previous many studies have proven the strong possibility of a carotid plaque in patients with hepatic steatosis [11, 17, 20]. Majority of our patients in NAFLD group were hypertensive. This finding could very well be explained on the basis of metabolic syndrome. The patients with metabolic syndrome have a higher incidence of fatty liver disease and atherosclerosis [20-22].

CONCLUSION

Hepatic steatosis is a reliable marker of increased CIMT. Since, IMT is a good predictor of cardiovascular disease, all patients having fatty liver on ultrasound should also be scanned for carotid lesions. This simple and non-invasive practice will help in early diagnosis of cardiovascular disease, especially in overt cases.

REFERENCES


