Assessment of the Prevalence and Clinical Significance of Asymptomatic Atherosclerotic Plaques in Lower Limb Vessels of Patients of Type 2 Diabetes Mellitus by Color Doppler Study

Shiv Chadha\(^1\), Rajesh Kumar Jha\(^2\), Dheerap Singh Lovewanshi\(^3\), Tanvi Singh\(^4\)

\(^1\)Postgraduate Student, Department of Medicine, Sri Aurobindo Medical College & PGI, Indore, India
\(^2\)Professor & Head, Department of Medicine, Sri Aurobindo Medical College & PGI, Indore, India
\(^3\)Department of Medicine, Sri Aurobindo Medical College & PGI, Indore, India
\(^4\)Postgraduate Student, Department of Radiation Oncology, Sri Aurobindo Medical College & PGI, Indore, India

Abstract: Diabetes Mellitus (DM) is a serious, chronic disease that occurs either when the pancreas does not produce enough insulin (a hormone that regulates blood sugar, or glucose), or when the body cannot effectively use the insulin it produces. Atherosclerosis involves a combination of fatty degeneration (atherosis) and of vessel stiffening (sclerosis) of the arterial wall. Peripheral vascular disease (PVD) of lower limb described as atherosclerosis below the bifurcation of abdominal aorta. The severity and duration of DM are important predictors of both the incidence and the extent of PVD. The aim of our study is to identify the prevalence of asymptomatic atherosclerotic plaques in type-II diabetes mellitus patients, using color doppler ultrasonography and to associate it with risk factors like hyperlipidemia, hypertension, obesity, smoking, coronary artery disease (CAD), family history and duration of diabetes. It is an observational study done on 100 cases of type 2 diabetes mellitus who presented at our centre during study period. The Pearson’s Chi-Square test had used to demonstrate the associations of risk factors like, hyperlipidemia, hypertension, obesity, smoking, coronary artery disease (CAD), family history and duration of diabetes. The prevalence of asymptomatic atherosclerotic plaques in lower limb vessels of diabetic patients was found to be 52%. It showed significant association with hyperlipidemia, hypertension, obesity, smoking, coronary artery disease (CAD), family history and duration of diabetes. In our case study, the prevalence of asymptomatic atherosclerotic plaques was studied among patients with established type —II diabetic mellitus using Colour Doppler Ultrasonography and correlation of the Atherosclerotic Plaque morphology with risk factors was made. The study group comprised of 100 patients of type 2 diabetes mellitus.

Keywords: Type 2 diabetes mellitus, peripheral vascular disease, atherosclerotic plaques, colour Doppler study.

INTRODUCTION

Diabetes Mellitus (DM) is a serious, chronic disease that occurs either when the pancreas does not produce enough insulin (a hormone that regulates blood sugar, or glucose), or when the body cannot effectively use the insulin it produces. Globally, an estimated 422 million adults were living with diabetes in 2014, compared to 108 million in 1980\(^1\). India had 69.2 million people living with diabetes (8.7%) as per the 2015 data. Type 2 Diabetes Mellitus i.e non-insulin dependent diabetes mellitus (NIDDM) accounts for over 85% of diabetics patients worldwide. This rise is seen mainly in developing countries like India. By year 2025, India will become the “Diabetic Capital of the world”\(^3\). Atherosclerosis involves a combination of fatty degeneration (atherosis) and of vessel stiffening (sclerosis) of the arterial wall. Peripheral vascular disease (PVD) of lower limb described as atherosclerosis below the bifurcation of abdominal aorta, this could lead to progressive narrowing of the lower limb arteries leading to claudication, gangrene and amputation \(^2\). The risk of PVD increases substantially with age \(^3\)–\(^4\). The prevalence of PVD is 4.8%, 12.0% and 22.0% for men and women aged 60-69 years, and >80 years, respectively \(^5\). PVD is also several times more common among diabetic subjects compared to non–diabetic subjects \(^6\), \(^7\). The severity and duration of DM are important predictors of both the incidence and the extent of PAD, as observed in United Kingdom Prospective Diabetes Study, where each 1% increase in glycosylated hemoglobin (Hb1Ac) was correlated with a 28% increase in incidence of PAD.
and higher rates of death, microvascular complications and major amputation[8,9]. The gold standard for diagnosis of PVD is angiography. However, the use of this technique is limited due to its invasive nature, the use of contrast agents and the cost. The Color Doppler Ultrasound (CDU) is a non invasive technique. The aim of our study is to identify the prevalence of asymptomatic atherosclerotic plaques in type-II diabetes mellitus patients, using color Doppler ultrasoundography and to associate it with risk factors like hyperlipidemia, hypertension, obesity, smoking, coronary artery disease (CAD), family history and duration of diabetes.

MATERIALS & METHODS

The present study was an observational study entitled “Assessment of the prevalence and clinical significance of asymptomatic atherosclerotic plaques in lower limb vessels of patients of type 2 diabetes mellitus by color doppler study” was conducted at Sri Aurobindo Medical College & PG Institute, Indore, a 1200 bedded tertiary care and referral center situated in heart of the city with state of the art technology catering to all sections of the society.

Duration of Study

The study was conducted from December 2015 to June 2017 among the patients who presented as outdoor patient (OPD) and in patients at Sri Aurobindo Medical College & PG Institute, Indore.

Sample Size

100 patients with established diabetes mellitus without symptoms of peripheral vascular disease were enrolled for the study.

Table No.1

All these patients were planned to generate the prevalence and clinical significance of asymptomatic atherosclerotic plaques in lower limb vessels using color doppler ultrasonography for this observational study purpose.

The age distribution of studied patients with asymptomatic type-II diabetes mellitus is highlighted in table 1.

Table-1: Association of obesity, smoking history, hypertension and coronary artery disease history of patients of type 2 diabetes mellitus with atherosclerotic plaques in lower limb vessels

<table>
<thead>
<tr>
<th>Parameter/Variable</th>
<th>Atherosclerotic Plaque</th>
<th>Total patient</th>
<th>p-value (LOS)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Absent</td>
<td>Present</td>
<td></td>
</tr>
<tr>
<td>Obesity</td>
<td>No</td>
<td>31</td>
<td>64.6%</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>17</td>
<td>35.4%</td>
</tr>
<tr>
<td>Smoking History</td>
<td>No</td>
<td>29</td>
<td>60.4%</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>19</td>
<td>39.6%</td>
</tr>
<tr>
<td>Hypertension</td>
<td>No</td>
<td>26</td>
<td>54.2%</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>22</td>
<td>45.8%</td>
</tr>
<tr>
<td>Coronary Artery Disease History</td>
<td>No</td>
<td>35</td>
<td>72.9%</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>13</td>
<td>27.1%</td>
</tr>
</tbody>
</table>

$^*$ The association is significant at the 0.03 and 0.02 level of significance. $^a$ The association is highly significant at the 0.005 level of significance. $^b$ The association isn’t (Insignificant) significant at the 0.05 level of significance. [LOS-Level of Significance]

Available online: http://saspublisher.com/sjams/
The association is highly significant at the 0.001 level.

hospitalization for PAD was found to be 52.0% and mortality age 2.73 for age (Mean ± SD)

The association isn’t (Insignificant) significant at the 0.05 level of significance.

The scatter for age (Mean ± SD) included, duration disease (PAD) is defined as

Available online: http://saspublisher.com/sjams/
possible explanation for this could be that the adoption of a Mediterranean diet by the Greek people may reduce the impact of dyslipidemia on PVD [13]. In 2006 Agrawal RP et al. [14] had done a Population based cross sectional study included 4067 diabetic patients. They concluded that the prevalence of dyslipidemia is high in diabetic population. Patients with type 2 diabetes generally have an atherogenic lipid pattern characterized by high triglyceride and low HDL cholesterol concentrations. However, the atherogenic influence of lipids in patients with diabetes is not necessarily linked to the degree of dyslipidemia only, but also to altered, particularly atherogenic, particles in patients with type-2 diabetes.

In our study group, 12 patients had a history of heart disease. Atherosclerotic plaques were detected in 7 patients. Presence of atherosclerotic plaques a in heart disease patient is statistically significant (p=0.003). However, it was seen that HbA1c is not an independent risk factor. Similar significant data were also found in a Chinese study of 2006 [15]. In 2005 Elizabeth Selvin et al.[16] conducted a prospective case-cohort study of 1321 adults without diabetes and a cohort study of 1626 adults with diabetes from the Atherosclerosis Risk in Communities Study and assessed the relation between HbAic level and incident CHD during 8 to 10 years of follow-up. They concluded that elevated HbAic level is an independent risk factor for CHD in persons with and without diabetes.

Guan h et al. [16] concluded that the duration of diabetes course was positively correlated with the prevalence of PVD (chi2 = 11.9, P = 0.0026). The ABI abnormality rate was 15.78% among those with a diabetic course of 5 years and was 23.84% among those with a diabetic course of 10 years. The HbA1c value of the PVD patients was significantly higher than that of the patients without PVD (chi2 = 5.10, P = 0.0239).

CONCLUSIONS

In our case study, the prevalence of asymptomatic atherosclerotic plaques was studied among patients with established type —II diabetic mellitus using Colour Doppler Ultrasonography and correlation of the Atherosclerotic Plaque morphology with risk factors was made. The study group comprised of seventy two patients [17] of type II diabetes, out of which 50 were taken into study.

- Height, Weight, Waist circumference and Blood Pressure were measured according to fixed criteria.
- Haematological & biochemical parameters like haemoglobin , fasting and post prandial blood sugar, HbA1c, lipid profile, serum BUN and serum creatinine were done
- Persons fulfilling the criteria of Diabetes Mellitus according to the National Diabetes group and World Health Organization criteria were identified and compared.
- Mean age among the study group comprising of 50 patients was 59.22 ± 13.9 years.

- Female: Male sex distribution was in the ratio of 1: 1 (Females = 50 %, males = 50 %).
- 26 % (females = 3, males = 10) subjects had Atherosclerotic plaques.
- Out of 50 subjects, 58 were % hypertensive, 26 % were smokers, 68% were obese, 24% had heart disease, 60% were found to be dyslipidaemic while 42% had family history of diabetes.
- Mean BMI of the study group was 27.49 ± 26.72 Kg/m2 and the corresponding waist circumference value was 95.48 ± 14.91 cm. • A large subset of study population on basis of BMI was overweight (14 %) and obese (68 %). (According to Consensus Statement for Diagnosis of Obesity, abdominal Obesity and the Metabolic Syndrome for Asian Indians)[17]
- Patients with Atherosclerotic plaque had mean systolic blood pressure of 139.07 ± 22.29 mm Hg and mean diastolic blood pressure of 87.08 ±15.74 mm Hg.

REFERENCES


