Intima-media thickness evaluation of common carotid and internal carotid arteries by sonography in Type - 2 diabetes mellitus and its correlation with physical and biochemical parameters

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Aims and objectives

- To evaluate the carotid IMT in patients Type-2 Diabetes and in age and sex matched controls.
- To compare the IMT in both these groups.
- To study the correlation of IMT with physical and biochemical parameters.
Methods and materials

Carotid sonography was performed prospectively in 100 individuals. Of these 50 were Type-2 diabetics and 50 were non-diabetic controls. Inclusion criteria: age 40-70 years, and both the sexes. Patients with valvular heart diseases, pregnancy, past history of connective tissue disorders/vasculitis/ recurrent strokes and patients on statin therapy for more than 1 year for any indication were excluded from the study. Ultrasonographic scanning of carotid arteries was performed using higher resolution B mode colour Doppler and an electrical linear transducer of 12 MHz was used. IMT is anechoic zone between two echogenic lines, first echo is lumen-intima surface, and second echo is caused by media-adventitia interface. [Figure 1] The IMT of the common and internal carotid arteries was measured bilaterally. Highest value in each carotid is taken and average of 2 measures is taken as IMT. After all the necessary tests, we have done the analysis of IMT in Cases and Controls. A detailed medical history and biochemical data like the blood sugar and lipid profiles were obtained in each individual and correlated with the IMT.
Fig. 1: IMT is anechoic zone between two echogenic lines, first echo is lumen-intima surface, and second echo is caused by media-adventitia interface.

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Results

Carotid sonography was performed prospectively in 100 individuals. Of these 50 were Type-2 diabetics and 50 were non-diabetic controls. Age distribution in diabetic patients: 41-50 years age 12 patients (i.e. 24 %), 51-60 years age 15 patients (i.e. 30 %), and 61-70 years age 23 patients (i.e. 46 %). Age distribution in non-diabetic patients: 41-50 years age 12 patients (i.e. 24 %), 51-60 years age 14 patients (i.e. 28 %), and 61-70 years age 24 patients (i.e. 48 %). Mean age in diabetic was 60.70±8.24 years and in non-diabetic was 61.20±8.55 years.

Gender distribution in diabetic: male 35 (i.e. 70 %) and female 15 (i.e. 30 %). Gender distribution in non-diabetic: male 38 (i.e. 76 %) and female 12 (i.e. 24 %).

Intima-media thickness of the diabetic group (0.75 ± 0.148 mm) was significantly higher (p-value 0.021, i.e. p-value <0.05) than that of the non-diabetic group (0.59 ± 0.154 mm).

Intima-media thickness of males in the diabetic group was significantly higher (0.76 ± 0.16 mm) than that of males in the non-diabetic group (0.62 ± 0.146 mm). Intima-media thickness of females in the diabetic group was significantly higher (0.738 ± 0.112 mm) than that of females in the non-diabetic group (0.57 ± 0.16 mm).

Plaque was present in 12 (i.e. 24 %) and absent in 38 (i.e. 76 %) diabetic patients as compare to the plaque was present in 7 (i.e. 14 %) and absent in 43 (i.e. 86 %) non-diabetic patients. Incidence of Plaque was statistically more in cases (24.0%) when compared to Controls (14.0%) with p-value of 0.226. [Figure 2, 3]

The diabetic group had significantly higher levels of triglycerides (p-value 0.04, i.e. p-value <0.05), LDL (p-value 0.036, i.e. p-value <0.05), VLDL (p-value 0.045, i.e. p-value <0.05) and lower levels of HDL (p-value 0.02, i.e. p-value <0.05) compared to the controls.

IMT was significantly higher in diabetic smokers (p-value 0.035, i.e. p-value <0.05) as compared to those who did not smoke in the diabetic. IMT was significantly higher in non-diabetic smokers (p-value 0.047, i.e. p-value <0.05) as compared to those who did not smoke in the non-diabetic.

IMT was significantly higher in diabetic alcoholics (p-value 0.026, i.e. p-value <0.05) as compared to those who did not consume alcohol in the diabetic. IMT was significantly
higher in non-diabetic alcoholics (p-value 0.039, i.e. p-value <0.05) as compared to those who did not consume alcohol in the non-diabetic.

So, IMT was higher in smokers and alcoholics as compared to those who did not smoke or consume alcohol in both the diabetic and non-diabetic individuals.

IMT had a positive correlation with systemic blood pressure and duration of diabetes mellitus.
Fig. 2: Hypoechoic non calcified plaque in posterior wall of the right distal carotid bulb extending into the right proximal internal carotid artery.

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Fig. 3: Hypoechoic plaque with echogenic calcific foci within is present in posterior wall of left carotid bulb.

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Conclusion

IMT of carotid arteries is increased in Type-2 Diabetic patients as compared to the control subjects. Systemic blood pressure, increased duration of Type-2 Diabetes, smoking and alcohol consumption are important risk factors for increased IMT. Routine sonographic evaluation of carotid arteries in Type-2 Diabetic patients is helpful in identifying patients with substantial atherosclerotic burden.
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