PILOT STUDY OF CORONARY ARTERY CALCIFICATION BY COMPUTERIZED TOMOGRAPHY AS NON-INVASIVE PREDICTOR OF CORONARY ARTERY DISEASE IN ASYMPTOMATIC ELDERLY DIABETICS

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ABSTRACT:

75-80% mortality in diabetics result from coronary artery disease. Helical computed tomography is a noninvasive technology for evaluating the extent of coronary artery atherosclerosis by detecting coronary artery calcium. In our study, we analyzed the data of CT scans in 25 diabetic and 25 nondiabetic population, who are > 70 years. We found calcium density > 400 HU is more in elderly asymptomatic diabetics (75%) when compared to nondiabetic elderly patients (20%), which is statistically significant (p=0.03). Therefore, screening such high risk population is warranted, so as to take early preventive steps and decrease morbidity and mortality.

Key Words: Helical CT, Coronary Artery Calcium score, Diabetes

INTRODUCTION

Diabetes is ravaging disease for those who have it and frustrating disease for those who treat it. The prevalence of diabetes is increasing day by day and by 2025 India would become 'Diabetes Capital' of the world [1]. Silent Myocardial Infarction and ischemia is much higher in diabetics because of autonomic neuropathy [2]. About 75-80% mortality in diabetics result from coronary artery disease (CAD) [3]. According to NCEP-ATPIII diabetes is 'CHD Risk Equivalent' [4]. Hence early detection of CAD is warranted by allowing strategies designed to prevent fatal and irreversible cardiovascular events in these patients. Helical computed tomography (CT) is a noninvasive technology for evaluating the extent of coronary artery atherosclerosis by detecting coronary artery calcium (CAC). CAC scoring as detected by helical CT is directly proportional to the atherosclerosis plaque burden [5].

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AIMS & OBJECTIVE

1. To see whether there is an increased prevalence of coronary artery calcification (early marker of atherosclerotic plaque) in elderly asymptomatic diabetics using Helical Computed Tomography.
2. To see the distribution of calcium in coronary arteries in diabetic subjects.

RESEARCH DESIGN AND METHODS

We recruited the asymptomatic patients above 70 years with or without diabetes who came to helical CT for the diagnosis of CAD. Group 1 is control group consisted of non-diabetic healthy subjects and Group II is patients group consisted of age and sex matched diabetic patients. We collected data from routine investigations like blood biochemistry, complete urine analysis, liver function test, renal function test, serum lipid profile, skiagram of chest, electrocardiogram and ultrasonography of abdomen in both groups. Special investigations included glycosylated hemoglobin, fundus examination of the eye, echocardiography and helical CT. We calculated the calcium score depending on HU on CT scan.

RESULTS

50 patients were recruited for this study. Group 1 (control group) consisted of 25 non-diabetic healthy subjects and Group II (patients group) consisted of 25 age and sex matched diabetic patients. Details of demographic features of both the groups are mentioned in Table 1.

Table 1: Demographic features of both the groups

Features	Control group	Study group
Number of Patients	25	25
Age (Years)	72	72
Sex		
Male	18 (72%)	18 (72%)
Female	7 (28%)	7 (28%)
BMI (Kg/m2)	23.2	23.2
Cardiovascular risk factors		
Smokers		
Yes	15 (60%)	15 (60%)
No	10 (40%)	10 (40%)
Hypertension		
Yes	13 (52%)	13 (52%)
No	12 (48%)	12 (48%)
Family history of CAD		
Yes	7 (28%)	7 (28%)
No	18(72%)	18(72%)
Raised serum Cholesterol		
Yes	20 (80%)	20 (80%)
No	5 (20%)	5 (20%)

Distribution of CAC score, depending on severity (< 5, 5 to 100, 100 to 400 and > 400HU) in both groups is mentioned in Fig 1.

Left anterior descending was the culprit artery in 70% diabetics while it was involved in only 50% subjects of control group. Left circumflex artery was involved in 38% diabetics, in contrast to 30% in control group subjects. Right coronary artery involvement was not significantly different in both the groups (42%vs 40%) (Fig.2). There is increased calcification in LAD and LCx arteries in diabetics.

DISCUSSION

Diabetes is a coronary heart disease risk equivalent. It is characterized by accelerated atherosclerosis with increased amounts of connective tissue, glycoproteins and calcified plaque in blood vessels. Margolis et al

Fig 1: Calcium density was < 5HU in 35% diabetics and it was > 400 HU in 75% diabetics. In both CAC severity range that is 100 to 400 and > 400HU, elderly diabetics showed more incidence which is statistically significant (p= 0.03).

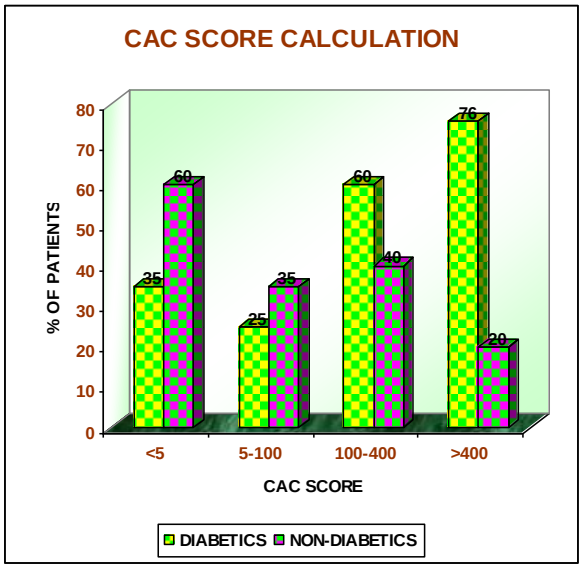
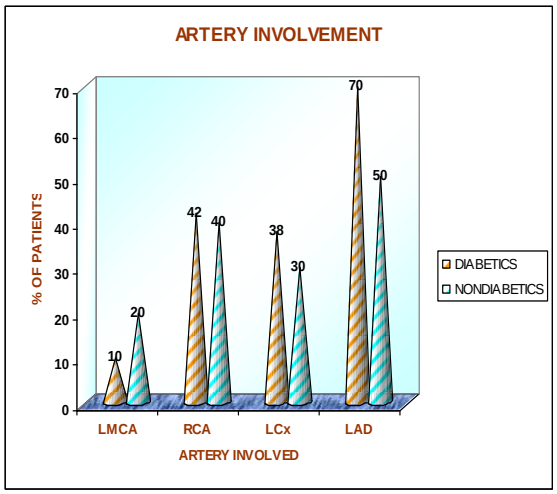


Fig 2 : CAC distribution in different coronaries



[6] showed the significance of coronary artery calcification in diagnosis of CAD and in determining its prognosis. In their study the calcified foci were detected in coronary arteries area at fluoroscopic assessment of 800 patients and their impact on future cardiac events was evaluated. For the first time in 1979 Guthaner and her Colleagues demonstrated the ability of computed tomography (CT) to find coronary artery calcifications [7]. Thereafter, it was gradually demonstrated that CT is

much more sensitive than fluoroscopy in calcium detection [8]. Rumberger et al [9] made a comparison of Electron beam CT findings measured calcified atherosclerotic plaque area with plaque area measured in histopathologic findings of 13 heart autopsy exams. They figured out that there was a close association between plaque extent and coronary calcification area. The discrepancies could be described by the presence of non-calcified plaques and so called "positive remodeling" of coronary arteries. The first practically applicable quantitative CACS protocol was introduced by Arthur Agatson and his colleagues in 1990 and has still remained the standard method in CACS. The stratified density scores 1, 2, 3 and 4 represents densities 130-199 HU, 200-299 HU, 300-399 HU and > 400HU, respectively. In a 8 year follow up study of 716 asymptomatic diabetics it was shown that those who had higher CAC score (> 400) had significantly higher prevalence of annualized cardiac events (myocardial infarction and cardiac death) compared to those with lower scores (5.6% versus 0.7%, P<0.01) [10] [11].

Limitation Of The Study:

As the total number of cases recruited are too small, to extrapolate their data to all elderly diabetics is not possible. But this study is giving a signal that non-invasive evaluation of asymptomatic elderly diabetics is required that too by CT scan.
Conventional or CT CAG data of these patients are not included, which is very important to know the presence or absence of CAD with calcium on CT.

CONCLUSION

Our results indicate the presence of significant high score CAC in asymptomatic elderly diabetic patient population which may reflect the underlying CAD. CT may be a useful non-invasive approach for screening such risk population so as to take early preventive steps and decrease morbidity and catastrophic complications in them.

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