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Silent Myocardial Infarction in Type 2 Diabetes Mellitus: Prevention Is Prudent Than Diagnosis and Management.

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ABSTRACT

About 21% of diabetic patients develop Silent Myocardial Infarction (SMI). A long term survival rate after SMI is poor over the next 6-7 years. In view of lack of symptoms like chest pain, it is not easy to diagnose SMI. Presence of Q wave in Electro cardio graphy (ECG) alone may suggest a SMI and in many cases Q wave disappears after sometime. ECG is considered as poor investigation technique for diagnosis of SMI. SMI is diagnosed objectively using very expensive investigations such as thallium perfusion imaging. Hence, to prevent the disastrous consequences of SMI it is prudent to assume that all type 2 diabetic patients above the age of 50 years as suffers of Coronary artery disease (CAD) and they should be started with established cardioprotective pharmacological regimen comprising antiplatelet agents, lipid lowering agents and ACE inhibitors. In addition it has been shown that patients with diabetic retinopathy are more prone for CAD and coronary artery bypass graft (CABG) offers them better survival rate. Further, oral hypoglycemic drugs such as acarbose and glimepiride which have been shown to have favorable effect on CAD, should be liberally used. In addition, advice to patients on the importance of fiber rich, low glycemic, vegetable protein diet and exercise should be part and parcel of management of diabetes.

Key words: Silent Myocardial infarction, diabetes mellitus, acarbose, low glycemic diet, vegetable protein diet, exercise.

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INTRODUCTION

Myocardial infarction (MI) is a killer disease. It has been documented beyond doubt that as much as 25% of patients who had MI die before reaching the hospital. However, fortunately if prompt treatment is initiated within 90 minutes of development of infarction, the mortality rate can be minimized almost to 3% [1]. Unfortunately, MI also occurs without any symptoms; the reported proportion of such silent MI ranges from 22 to 40 % [2]. This is especially so for patients with diabetes who are at greater risk of MI. Active screening studies have also shown that unrecognized MI has a relative poor prognosis [3,4]. The prevalence of Silent Myocardial Infarction (SMI) appears to be higher in patients with diabetes mellitus compared with non diabetics [5]. The diagnosis of SMI involves heavy economic burden and not affordable by many. So it is wise to prevent SMI rather than diagnosing and treating which also involves huge cost. This article mainly focuses on this aspect.

Diagnosis of SMI In Diabetes Mellitus Patients

Diagnosis of MI in diabetes mellitus (DM) patients is not easy as significant number of patients do not experience the main symptom of chest pain. Their late presentation contributes to a higher mortality. It has been suggested that if new Q waves are identified with Electro Cardio Graphy (ECG) taken routinely, more than 50% risk of subsequent MI is probable. ECG cannot be used as a tool for diagnosis of SMI in type 2 diabetes unless it is done daily, which is not practical. The presences of Q wave on baseline ECG do not identify patients who would benefit from more aggressive therapy. Hence, the current concept is that if new Q wave are identified during routine ECG, cardiac imaging should be performed to evaluate the extent of actual myocardial damage [5].

There is evidence that Q wave can resolve with time. In addition, a significant number of infarcts never evolve into Q wave. It was also observed that ECG alone detected only 5% of SMI. Further it has been shown that when diabetic patients without symptoms and with normal ECG underwent cardiac stem testing, 17% were found to have significant Coronary Artery Disease (CAD) despite their absence of symptom [6]. Therefore ECG is less specific for diagnosis of SMI in diabetic patients. Hence, it is imperative that focus is made on preventive strategy of CAD. In many developing countries such as India resources are limited. Hence, majority of patients cannot afford access to imaging. It is well established that CAD is the ultimate cause of death in more than half of all patients with DM. It is important that focus be made on the preventive strategy of CAD by not subjecting the patients to expensive investigations such as thallium perfusion imaging and radio nuclear angiography. One of author (TM) experienced high rate of mortality in diabetic patients occurring around 50 yrs of age leaving behind the family in distress. Hence, it should be presumed that all diabetic patients aged over 50 years suffer from CAD. Further it is authors' opinion that some of investigations and treatment mentioned below which have been shown to benefit diabetic patients, are currently underutilized. It is emphasized that strong consideration should be given for incorporating them while managing DM in order to prevent CAD.

Relevant Investigations and Treatments

Test for micro albuminuria

The presence of micro albuminuria is a significant risk factor for Cardio Vascular Disease (CVD) as well as chronic Kidney disease (CKD). CKD is associated with a higher risk of CVD and patient with CKD are more likely to die from CVD rather than end stage renal disease. However, in spite of being a common co-morbid condition of type 2 DM, CKD often remains undetected and consequently untreated [7]. Hence, therapy should be initiated with angiotensin converting enzyme (ACE) inhibitors. They delay the progression to macro albuminuria and also improve fibrinolytic capacity. Improved fibrinolysis has been associated with decreased risk of recurrent MI. Furthermore, they also markedly improve insulin sensitivity and glycemic control. Apart from reducing MI, ACE inhibitors have been also shown to reduce the incidence of stroke which can be considered as brain attack similar to heart attack [8].

Fundus examination for retinopathy

More than 25% of the patients with type 2 diabetes have retinopathy within 2 years of diagnosis. Recent evidence demonstrates that severity of diabetic retinopathy is associated with increased risk of death from CAD and MI. CAD complicating diabetic retinopathy is often under diagnosed and all diabetic retinopathy patients should be screened for CAD.

The association of a statin with a fibrate will have major impact on lipid profile. Treatment with fenofibrate reduced not only the risk of first MI but also the risk of further cardio vascular death events after SMI. It has been shown that severity of diabetic retinopathy is associated with a graded increased risk of death from CAD and MI. Further, it has also been observed that survival benefit of coronary artery bypass grafting over percutaneous coronary intervention is more apparent in patients with diabetic retinopathy than in diabetic patients without it [9].

Even though diabetic patients are screened for nephropathy, it is a late sign of microvascular complication of DM. In contrast, diabetic retinopathy is a frequent and early sign of microvascular complication of DM. Within 5 or 10 years of diagnosis about 80% of type 2 diabetic patients have retinopathy. In addition more than 25% of type 2 DM have retinopathy within 2 years of diagnosis. Additionally, of all the complications of diabetes, retinopathy presents the physician with the unique opportunity to directly visualize and grade the progression of the disease. Recently it has also been demonstrated that among patients with type 2 diabetes, the presence of diabetic retinopathy is associated with a two fold higher risk of CAD events and three fold higher risk of CAD deaths. Therefore, it is mandatory that all diabetic patients should be screened for diabetic retinopathy regularly and patients with diabetic retinopathy should be considered for coronary artery bypass graft [9].

Though statins form main stay of treatment for dyslipidaemia, compared with statin monotherapy, the association of a statin with a fibrate will have major impact on triglycerides,

HDL and LDL particle size. Fenofibrate seems to be safer. In addition to favorable effect on lipid, it has also been shown to reduce the frequency of laser treatment for macular edema by 31%. Further, treatment with fenofibrate reduced not only the risk of first MI but also the risk of further clinical CVD events after SMI supporting its use in type 2 DM [10].

Sulfonyl Urea Therapy

Of all the sulfonylureas used in DM, Glyburide (glibenclamide) has been the commonly used drug for past 30-40 years especially in countries like India where the cost of the drug is very cheap. However, recently it has been observed this drug may prevent the beneficial effect of ischemic preconditioning and may be associated with increased cardiovascular risk. In contrast, glimepiride, a relatively newer drug introduced within past 15 years, exerts beneficial effect with regard to ischemic preconditioning [11]. Hence, changing over from glyburide to glimepiride may be beneficial even though the cost of glimepiride is slightly more than glyburide.

Alpha Glucosidase Inhibitors

The alpha glucosidase inhibitor acarbose has been shown to improve glycemic control significantly and to lower triglycerides levels, body weight, body mass index and systolic blood pressure. No serious adverse events related to acarbose were reported and a substantial highly significant risk reduction of 64% was achieved for MI [12]. However, we observe that this drug is somewhat underused in management of diabetes and this has become all the more relevant at present in view of the recently reported adverse effect-carcinoma bladder by pioglitazone. Pioglitazone has been one of the most potent drug in management of DM. In view of this adverse effect most physicians now are hesitant to use pioglitazone in management of diabetes [13]. Now there is also a need for alternative drug to pioglitazone and acarbose can be a good substitute.

Soluble fiber rich food

Though physicians are generally aware of the benefits of fiber rich diet in management of diabetes, often they find difficult to explain them to the patients among their busy schedule. This is especially so for primary care physicians in countries like India where they have to offer healthcare to a large number of patients daily. It is important to realize the value of both soluble and insoluble fibers. Insoluble fibers promote regular bowel movements and prevent constipation whereas soluble fibers reduce cholesterol especially levels of LDL; in addition they also regulate sugar intake; thus they protect from developing heart diseases. Further, people with diabetes who consume lot of fiber tend to need less insulin than those whose fiber intake is low. The information detailed below on rich source of soluble fibers will be of immense use to such patients (Table.1).

Table 1: Food sources of soluble and insoluble fibers

S.NO	FOOD	SOLUBLE FIBER CONTENT	INSOLUBLE FIBER CONTENT
1.	Barley	1 g	4 g
2.	Oatmeal	1 g	2 g
3.	Psyllium seeds ground (1tbsp)	5 g	6 g
4.	Apple	1 g	4 g
5.	Pear	2 g	4 g
6.	Black Bean	2 g	5.5 g
7.	Lentils	1 g	8 g

Dietary education to the patients regarding the value of fibers should form a part and parcel of diabetic management.

Low glycemic index (GI) of foods

Glycemic index is a relatively new way of analyzing carbohydrate containing foods. Previously most meal plans designed to improve blood sugar, analyzed the total amount of carbohydrates (including sugar and starch) in the foods themselves. GI goes beyond this approach looking at the impact of foods on actual blood sugar. In other words, instead of counting the total amount of carbohydrates in food in their unconsumed state, GI measures the actual impact of these foods on blood sugar. Low GI diets have been associated with decreased risk of CVD and metabolic syndrome. Further, they also reduce the risk of stroke [14]. The GI value of some of commonly used foods is shown in table 2.

Substituting Vegetable proteins for animal proteins

Recent studies have focused on the benefit of vegetable proteins. Vegetable proteins may be superior to traditional animal proteins diets for prevention and treatment of diabetic kidney disease. Substituting soy or other vegetable proteins for animal proteins may decrease renal hyper filtration, proteinuria, renal acid load and in the long term reduce the risk of developing renal disease in type 2 diabetes. There is also growing evidence that soy proteins lowers blood pressure and also reduce lipids. In addition, they also reduce serum homocysteine level - a possible risk factor for both coronary artery disease and stroke [15].

Insulin

In Type 2 diabetes, the only treatment which always reduces the blood sugar level is insulin injection. Unfortunately, it is found unacceptable by both patient and treating physician. A significant proportion of the type 2 diabetic patients fail to achieve good glycemic control with oral hypoglycemic agents alone. In such patients unhesitantly insulin should be used. Insulin, apart from attaining good glycemic control, reduces the elevated HbA1C near the therapeutic goal and produces beneficial effects on triglyceride and HDL-cholesterol levels [16].

Table 2: GI value of some of commonly used foods

S.NO	Food Group	Very low GI	Low GI	Medium GI	High GI
1.	Vegetables	asparagus	Garlic	Corn	potatoes
		avocados	Green peas	Sweet potatoes	
		Bell peppers	Onions		
		cabbage			
		broccoli			
		Cauliflower			
		Cucumber			
		Beans			
		Mushrooms			
		Olive oil			
		Spinach			
		Tomatoes			
		Turnip greens			
2	Fruits		Apples		Watermelon
			Grapefruit		
			Lemons/Limes		
			Oranges		
			Pears		
			Plums		
3	Nuts & Seeds	Flaxseeds	Almonds		
			Peanuts		
			Walnuts		
4	Beans & Legumes	Soybeans	Lentils		
5	Seafood	Cod			
		Salmon			
		Sardines			
6	Seafood	Cod			
		Salmon			
		Sardines			
7	Dairy		Cow's Milk Grass-Fed		
8	Grains		Barley		Instant Rice
			Brown rice		
			Oats		
			Rye		
9	Snacks			Popcorn	Rice Cakes
				Potato Chips	Jelly
					Corn Chips

Exercise

It is well established that aerobic exercise has long been recognized as one of the three main components of diabetic management namely; diet, drug and exercise. Regular exercise has been shown to improve glycemic control, systolic blood pressure endothelial dysfunction [17]. Hence, importance of exercise be realized while managing diabetes.

CONCLUSION

Research reveals that about 21% of the patients with DM develop SMI and the same is associated with significant mortality. Furthermore, MI in diabetic patients is usually more extensive and more severe than non diabetic patients. The 5 year survival rate for diabetic patients after the first major coronary event has been found to be 38% compared with the non diabetic patients of 75%. Diagnosis of SMI is not easy and quite expensive. In view of poor prognosis in SMI, it is wise to assume that all diabetic patients over the age of 50 years with two or more risk factors are to be considered as cases of CAD. They should be vigorously treated with established pharmacological regimen such as aspirin, statins and ACE inhibitors. In addition, the following measures as detailed above and summarized below should be put into practice, so that devastating consequences of SMI could be prevented.

- Screening for diabetic retinopathy, and if it is detected advising for CABG
- Inclusion of acarbose, the alpha glycosidase inhibitor and the recent sulfonylurea glimepiride, as routinely used anti diabetic drugs.
- Advising the patient on the importance of fiber rich diet and foods with low glycemic index value besides exercise.

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