

Role of High ORAC Value, Portion Controlled Diet on Progression of Atherosclerosis in Known CAD Patient: A Single Case Experimental Study

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Abstract

Introduction: It is known that diet plays a major role in metabolic disorders and CAD is no exception to it. Atheroma is developed due to oxidative stress and inflammation. This single case study was aimed to observe the effect of low calorie, high antioxidant diet on plaque volume.

Methods: Post-enrollment the patient underwent a CT-angiogram to measure plaque volume of the four major arteries. Thereafter for the next two months, the patient has advised a reverse diet kit, a scientifically designed diet box contains pre-portion ready to cook food products that fulfil daily requirements of breakfast, lunch, dinner, soup, and early morning diet. After two months the patient again underwent CT-angiogram.

Results: The results of the CT-angiogram show reduction in non-calcified plaque volume (baseline vs. post-diet: 48.9% vs. 38.4%). Also, there was a reduction in weight and blood pressure.

Keywords: Reverse Diet Kit, CT-angiogram, Coronary artery disease

Aim

To evaluate the effect of reverse diet kit on atheroma regression at 12 weeks from baseline in a known case of coronary artery disease patient.

Objectives

1. To evaluate the effect of reverse diet kit on weight, blood pressure and pulse rate
2. To compare the blood sugar level, calcified and non-calcified plaque volume at baseline and after the completion of the reverse diet programme for 12 weeks

Background

Cardiovascular diseases especially the coronary artery disease is the leading cause of mortality and morbidity in India with the prevalence rate increasing by the year [1,2]. It is a progressive disease characterised by the accumulation of lipids, inflammation and plaque formation [3]. The risk factors include smoking, diabetes mellitus, hypertension, obesity and high cholesterol [2].

Co-morbidities like diabetes and hypertension play an important role in plaque progression. The disease progression and risk of cardiovascular events is higher in T2DM patients [5]. Impaired glycemic control further leads to increased incidence of plaque formation in diabetic patients. High-intensity lipid-lowering drugs

aid plaque reduction though with exceptions due to several residual risk factors [5]. However, regression of atherosclerosis can be achieved through lifestyle as well as dietary changes. Low carbohydrate and antioxidant-rich diet help in the reversal of plaque formation [7].

Various imaging and diagnosis modalities are used for measuring the plaque volume of which some may be invasive while others are non-invasive techniques. However, there is always a preference of non-invasive technique but the results of it need to be comparable to the detailing of the results obtained by invasive techniques. One of the meta-analysis of forty-two studies that evaluated 1360 patients (75% men; mean age, 59 years) reported no significant difference between Computed tomography angiography (CTA, non-invasive) and Intravascular ultrasound (IVUS, invasive) measurements of vessel lumen cross-sectional area, plaque area, percentage of area stenosis, or plaque volume within the overall cohort [8].

In the present case study, the low calorie and high antioxidant diet prescribed to the patient with the aim of reduction in plaque volume as quantified by CTA and tapering of concomitant medications.

Case Presentation

Mr HK, a 71-year-old retired hospital ward-assistant and a Chronic Smoker with history of Hypertension, Diabetes, Asthma and COPD had an acute coronary event on 5th October 2019, his angiography was done on 11th October 2019 that showed TVD with LAD, RCA and LCx with 80-85% stenosis and cardiologist suggested him for CABG with continuous medical management. On presentation in the clinic, the patient weighed 72.0 kg with a BMI of 30.9 kg/m². On physical examination, the blood pressure was 130/80 mm of Hg, pulse-72 beats

per minute. The blood sugar levels were 142mg/dl. Post MI angiography, reports revealed Triple Vessel Disease with 80-90% stenosis Blockages while CT angiography was done on 11 November 2019 revealed 316.1 mm³ of blockage.



Figure 1. RCA image at baseline in November 2019.

After written informed consent, the patient was given the intervention of the Reverse Diet Kit for 12 weeks. As a part of the protocol, the patient was suggested to do the following:

- Daily walk and exercise (less aerobic).
- Blood pressure monitoring before going to walk and after coming from a walk.
- Daily assessment of weight.
- Assessment of Blood sugar levels every 3 days.
- Daily Update of the diet.

The following parameters were assessed during the entire intervention:

1. Assessment of weight, systolic and diastolic blood pressure and heart rate (Every week)
2. Assessment of blood sugar levels at baseline, Week 5, Week 6, Week 7, Week 8 and Week 11
3. Calcium score and calcium volume at baseline and post-intervention
4. Calcified and Non-calcified plaque volume at baseline and post-intervention
5. Lumen volume at baseline and post-intervention

6. Change in atheroma volume from baseline to post-intervention was calculated

7. Concomitant medications taken at baseline and post-intervention were recorded



Figure 2. RCA image post-intervention in January 2020.

The patient followed a reverse diet kit for 12 weeks. The Reverse diet kit is a scientifically designed diet box containing pre-portioned food products that fulfil the daily requirement of breakfast, lunch, dinner, soup and early morning diet options. The diet is anti-inflammatory with a high anti-oxidant capacity which helps in reversal of CAD progression, improves vessel health, reduces plaque and improves blood flow.

		Volume of Atherosclerotic Plaque			
Branch	of	Baseline in mm ³	12 weeks in mm ³	Difference in mm ³	% change
LAD		80.9	109.5	28.6	35.4
LCX		51.2	14.4	-36.8	-71.9
RCA		184	126	-58	-31.5
Total	Atheroma Volume	316.1	249.9	-66.2	-20.9

Table 1. Comparison of the individual artery and total atheroma volume from baseline to post-intervention.

The results observed after the 12-week diet plan is as follows:

1. Weight reduction of 7.3 kg was observed (almost 10% reduction in weight).
2. The blood pressure continued to be in the above normal limits.

3. The average pulse rate was 69 beats per minute
4. The average blood sugar was 138mg/dl
5. The overall change in calcium score of 2.8% from 7.5% at baseline.
6. There was no change in the calcified plaque volume
7. The non-calcified plaque volume changed from 48.9% at baseline to 38.4% post-intervention
8. The per cent lumen volume increased from 239.1 at baseline to 251.3 post-intervention
9. The change in the individual artery and total atheroma volume from baseline to post-intervention is depicted in Table 1.

Discussion

The present case study evaluated the effect of a low-calorie and high antioxidant diet on the weight, blood pressure, plaque formation and lumen volume of the arteries. A weight reduction of almost 10% was observed along with nearly 21% reduction in total atheroma plaque volume. Whereas the ASTEROID TRIAL with rosuvastatin showed a median reduction of 6.8% in total atheroma volume (mean (SD) reduction: -14.7 (25.7) mm³, median reduction: -12.5 mm³ (95% CI, -15.1 to -10.5 mm³) (p<0.001 vs baseline) [9].

Obesity is one of the known risk factors of cardiovascular diseases [5]. The metabolic burden on the body and increase in body weight is directly proportional to each other. Increase in body weight leads to increased storage of fat and carbohydrates. Low HDL levels and accumulation of triglycerides are key features of diabetic dyslipidemia which leads to poor vascular function as well as poor glycemic control [10, 11].

Similarly, excess of reactive oxygen species leads to vascular injury further leading to oxidative stress which plays an important role in the progression of atherosclerosis. Antioxidants help maintain a favourable balance, thus preventing unwanted consequences [12].

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In the present case study, the patient was given a low carbohydrate, an anti-inflammatory diet rich in omega-3 fatty acids, vitamins, minerals and anti-oxidants. The low carbohydrate diet leads to a reduction in glycemic index and triglycerides thus improving the vascular function. The omega-3 fatty acids present in the nuts of chiwada exert a cardioprotective effect by reducing the triglyceride levels and stabilizing the atherosclerotic plaques [13].

The soy proteins present in the soybean dhokla help in the reduction of serum lipid levels as observed by Anderson et al. in a meta-analysis of 38 clinical studies [14]. In addition to this, the antioxidant-rich pomegranate and garlic along with the antioxidant vitamins C and E present in the prescribed diet kit help maintain the

oxidant/anti-oxidant balance leading to reduction in oxidative stress [10]. Consumption of Vitamin C & E and carotenoids is inversely associated with CAD [15].

Thus, the consumption of the reverse diet kit leads to a negative calorie balance which makes the body use the stored glycogen in the adipose tissues. This further prevents the partial digestion and thus oxidative stress leading to stabilization of plaque formation as observed in the current case study. Similarly, the high Oxidative Radical Absorption Capacity (ORAC) units in the reverse diet kit aid in the cessation of atherosclerotic plaque progression. The antioxidant and anti-inflammatory action of the diet helped the reverse cholesterol transport and helped to the reduction of the plaque volume from its baseline.

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Conflicts of Interest

Authors have no conflict of interest to declare.

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