



Impact of Ayurveda Based Ischemia Reversal Program (IRP) And Polyherbal Medication on Reduction of Resting Myocardial Ischemia with Speckle Tracking Global Longitudinal Strain Imaging in Type 2 Diabetes Mellitus Patients

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Abstract

Background: Type 2 Diabetes mellitus (T2DM) is a major public health problem with hyperglycaemia leading to ischemia and myocardial damage. Two-dimensional speckle-tracking global longitudinal strain (GLS) imaging is one of the non-invasive tools used for early onset detection of left ventricular systolic dysfunction (LVSD) which goes undetected in the traditionally used tools. The standard of care provided to diabetic patients leads to several adverse effects leading to non-compliance and higher incidences of mortality and morbidity. The current study aimed to evaluate the efficacy of alternative treatment (Ischemia Reversal Program and diet kit) in improving GLS score in T2DM patients.

Methodology: This retrospective study was conducted from January 2020 to January 2021 in T2DM patients who attended the Cardiac Care Clinics, Mumbai. The patients underwent 14 sittings of IRP and calorie-controlled diet kit for 30 days. Change in GLS score from baseline formed the primary endpoint while the secondary endpoint were reduction in Body Mass Index (BMI), Abdominal girth (ABG), End diastolic volume (EDV) and dependency of modern medicines and outcome of 6 meter walk test (6MWT). **Results:** A total of 26 T2DM patients were enrolled with a mean age of 59 years. The GLS score ($p=0.0004$) and distance covered post 6MWT ($p=0.03$) showed a significant improvement post IRP treatment. There was a reduction in blood sugar levels and improvement in the cardiac parameters; the difference being not significant.

Conclusion: IRP may be an effective and sustainable addition to standard treatment of T2DM and IHD though future large-scale studies are warranted.

Keywords: Ischemia Reversal therapy, GLS, diabetes, diet kit

Introduction

Diabetes is one of the leading global public health problems with a huge economic burden on the healthcare system especially with a higher prevalence in the low- to middle-income countries (LMICs) like India ^[1]. India ranks second after China in number of diabetes cases which is expected to double by 2035 ^[2].

Type 2 Diabetes Mellitus (T2DM) is one of the key risk factors causing cardiovascular diseases due to hyperglycaemia, dyslipidemia and hypertension ^[3]. Hyperglycaemia in diabetes leads to ischemia and myocardial damage as well as left ventricular systolic dysfunction (LVSD) ^[4,5]. Though two-dimensional echocardiography (2D-ECHO) is the most commonly used non-invasive tool used for cardiac imaging, it fails to detect early onset of LVSD ^[5]. However, this can be evaluated by measurement of the

global longitudinal strain (GLS) score acquired through two-dimensional speckle-tracking echocardiography (2DSTE). The GLS is decreased in T2DM patients especially with underlying comorbidities [6].

Treatment strategies thus play an important role in the improvement of GLS score along with improved cardiac parameters. Currently, lifestyle modification along with dietary compliance is one of the primary management strategies for management of T2DM. This is followed by Metformin as the first line and sulphonylureas, sodium glucose cotransporter-2 (SGLT-2) as the second line of oral antidiabetic drugs [7]. However, with the rising adverse effects associated with these allopathic medicines a need of newer therapies as well as alternative treatments is required. Thus, the potential of Ayurvedic treatments should be explored in combination to standard of care. The beneficial effects of Ayurveda based therapies have been demonstrated in a number of case reports [8].

Ischemia Reversal Program (IRP) is one such alternative treatment option which involves a blend of Panchakarma in a combination of 3-step procedure; Centripetal oleation, Thermal vasodilation and per rectal drug administration with the use of herbal products to bring out the cardioprotective effect with the standard of care [9].

The present study was conducted with the objective of proving the efficacy of IRP in improving GLS score in T2DM patients.

Methodology

Ethics: The study was approved by the Ethics Committee and a prior consent was obtained from the participants regarding publication of data without disclosing their identities.

Study design and duration: This is a retrospective clinical observational study conducted from January 2020 to January 2021 at Madhavbaug clinics in Mumbai, India.

Eligibility criteria: Patients of either gender having a clinical diagnosis of known Type 2 Diabetes Mellitus (T2DM) aged between 40 to 75 years with a GLS score >-16 and ready to follow the study treatment for 7 days as well as follow-up after 1 month were included in the study while patients with unstable angina, acute illness and a GLS score of <-16 were excluded from the study.

Study procedure: Known cases of T2DM were screened with GLS 2D echo to identify the GLS score at baseline. All the patients with a GLS score >-16 underwent 14 sittings of Ischemia Reversal Program (IRP) and Panchakarma completed in 7 days. The patients followed a restricted calorie diet for 30 days. The patients were also prescribed oral medicines; Tab GHA (2 tablets BD before meal) and ARJ Kadha (10ml BD post meal) for a month. The weight, abdominal girth (ABG), Body mass Index (BMI), GLS score, LV mass, End-diastolic volume (EDV), Stroke volume and blood sugar levels were measured at baseline and Day 30 while routine biochemical investigations (LFT, RFT, Lipid profile) were done only at baseline. A 6-minute walk test (6MWT) was also conducted at baseline and Day 30. The details of the allopathic medications taken by the patients was collected at baseline and compared at Day 30. The primary endpoint of the study was change in GLS score from baseline and the secondary endpoint was reduction in the BMI, ABG, and EDV along with dependency of modern medicines.

Study Intervention

a) **Ischemia Reversal program (IRP):** A Panchakarma based Ayurvedic therapy involving the following 3 steps [10]:

1. **Centripetal Oleation (Snehana):** It involves a massage with sesame oil (80%) with Lavender fragrance (20%) for

20 mins with strokes directed towards the heart in a centripetal manner.

2. **Thermal Vasodilation (Swedana):** It involves a passive heat therapy using 15ml of Dashamool (ten herbal roots) Kadha in a wooden box. The patient lies down in a supine position with his/her neck outside the box (temperature range: 45°C to 55°C) for 10 to 15 minutes or till the time the patient can tolerate the heat.
3. **Per Rectal Drug Administration (Basti):** This is the final step wherein per rectal herbal drugs (extracts of Tribulus terrestris, Curcuma longa, and Emblica officinalis in a 100ml decoction) are administered for about 15 min.

b) Calorie-controlled diet:

A low calorie and low carbohydrate diet based on pulse protein, complex carbohydrates, high consumption of fruits and vegetables and good quality fats was administered to the participants. Since it has lesser calories (800kcal diet) and lesser carbohydrates (30% of total calorie), it helps reduce fat stores in body leads to reduction and insulin resistance. All products in diet kit are unique combinations of pulse and cereals. The contents of the diet kit are as follows:

1. Herbal atta mix: A combination soybean, moong, baarley, khapliwheat and chana flour along with herbal medicine like jamun and arun powder.
2. Breakfast options: Options include roasted sprouted moong/roasted soy nuts/roasted chana/idli mix/uttappa mix/moong daliya mix/thalipeeth mix. All these options have added medicinal herbs like cinnamon, fenugreek seeds and high fiber.
3. Herbal soup mix: A blend of various vegetables and moringa powder which are high in antioxidant- potassium and low in carbohydrates and calories
4. Magic masala: Consists of amla powder, coriander seeds, cumin, sesame, rocksalt, cinnamon, fennel-amchur powder and garlic powder giving a potent effect on sugar control. Also helps in relive indigestion and healthy twist to regular homemade masala.
5. Herbal tea
6. Supari mix: A mixture of fennel seeds, roasted coriander seeds, cloves and jeshthimadh helps in lowering high sugar levels and helps in decreasing indigestion.
7. Kokum juice and daal mix

Statistical analysis: Data analysis was performed using both descriptive and inferential statistics. Normality of continuous data was checked using the Kolmogorov – Smirnov test. Continuous data (i.e. demographics, cardiac parameters, blood sugar and GLS score) were presented as Mean \pm Standard Deviation (S.D.) or Median (Range) depending on the distribution of the data. Categorical data (gender and medications use) were presented as numbers and proportions. The change in the primary and secondary endpoints at baseline and post IRP was determined using paired t-test and Wilcoxon matched pairs test as per the distribution of the data. One-way analysis of variance (ANOVA) with a post hoc Tukey-Kramer multiple comparisons test was used to identify the significant differences between subgroups. All statistical analysis was done using Microsoft Corporation. (2018). Microsoft Excel and the statistical significance was set at <0.05 .

Results

Baseline Clinical and Demographic characteristics

Twenty-six T2DM patients were considered eligible for the study. Of these, majority (84.6%) were males with a mean age of 59 years. The mean BMI and ABG of the study population were 24.65 ± 4.09 kg/m^2 and 95.11 ± 10.3 cm at baseline (**Table 1**). The study population comprised of participants with diverse co-morbidities in

addition to T2DM with the highest being hypertension (65.4%) followed by CAD (50%) and IHD (34.62%) (Table 1).

Effect of IRP of demographic and clinical parameters

The change in GLS score showed a statistically significant improvement ($p=0.0004$) after IRP relative to the baseline. The weight, ABG, BMI and blood sugar levels showed a reduction post 30-day IRP therapy relative to the baseline; however, the difference was not statistically significant ($p>0.05$). Similarly, though the cardiac parameters such EF, LV mass and EDV did increase after 30 days of therapy; the difference was not statistically significant ($p>0.05$) (Table 2).

Effect of IRP on 6MWT

The mean distance covered in the 6MWT increased significantly post treatment as compared to the baseline (Baseline: 277.2 ± 99.36 meters vs. post-treatment: 372.72 ± 83.45 meters; $p=0.03$). However, there was no significant change in heart rate and blood pressure during the 6MWT post-treatment relative to the baseline ($p>0.05$).

Effect of IRP on concomitant medicine consumption

The percentage consumption of concomitant medications was reviewed at baseline and at Day 30. The percentage consumption of anti-platelet drugs, calcium channel blocker (CCB), Sulfonylurea, Biguanide, Nitrate, Vasodilators, Angiotensin Converting enzyme (ACE) and Proton Pump Inhibitor (PPI) had decreased for most of the patients by the 180-day follow up. The details of these concomitant medications are listed in Table 3.

Table 1: Baseline demographic and clinical parameters of the patient population

	N=26
Age(yrs); Mean \pm SD	59.3 \pm 7.76
Gender: Male, n (%)	22 (84.6)
BMI (kg/m ²)	24.65 \pm 4.09
ABG (cm)	95.11 \pm 10.3 cm

Table 2: Baseline and post-treatment comparison of demographic and clinical parameters

Variable	Baseline	Post-treatment (Day 30)	p-value
Weight (kg)	67.08 \pm 11.55	65.43 \pm 10.85	0.61
ABG (cm)	95.11 \pm 10.77	92.80 \pm 10.52	0.45
BMI (kg/m ²)	24.65 \pm 4.096	23.20 \pm 3.45	0.18
GLS	-10.35 \pm 3.11	-11.80 \pm 3.48	0.0004
Fasting Blood Sugar (FBS)	136.65 \pm 24.55	125.65 \pm 17.14	0.09
Post-prandial sugar (PP)	147.39 \pm 32.86	154.52 \pm 29.69	0.45
Ejection Fraction (EF)	42.88 \pm 13.21	46.38 \pm 10.68	0.31
LV mass	103.19 \pm 26.15	110.93 \pm 10.59	0.33
EDV	132.80 \pm 48.51	138.12 \pm 45.02	0.71

Table 3: Medicine consumption at baseline and Day 30

Allopathic Medicine	Day -1 (n)	Day -30 (n)	Medicine Reduction (%)
Angiotensin II receptor blockers	5	3	40.04
B-blocker	13	7	46.04
Diuretics	9	5	44.44
Ca ²⁺ channel blockers	2	1	50.00
NSAIDs	10	10	0.00
Biguanides	6	8	33.33
DPP4 inhibitor	7	5	28.57
Sulfonylureas	9	7	22.22
Antiplatelet	14	10	28.57
Statins	13	7	46.15
Nitrates	4	4	0.00
ACE inhibitor	2	1	50.00
Insulin	2	0	100.00

Discussion

Our study evaluated impact of Ayurveda based Ischemia Reversal Program (IRP) and poly herbal medication on reduction of resting myocardial ischemia within 4 weeks using speckle tracking Global Longitudinal Strain imaging and found a significant improvement in the GLS score post IRP treatment.

Myocardial damage and LVSD might remain undetected in T2DM patients without CAD. GLS has the ability to detect myocardial abnormalities even though the EF is normal [11]. Holland *et al.* [12] evaluated the GLS score for 10-year outcomes in subclinical myocardial dysfunction in 249 T2DM with normal LVEF. Their results indicate that subclinical LVD is detectable by GLS imaging thus emphasizing the importance of monitoring GLS score in T2DM patients.

IRP is a 3-step Panchakarma based Ayurvedic procedure comprising of *Snehana*, *Swedana* and *Basti* each having its own cardioprotective effects [9]. In *Snehana*, the centripetal massage

strokes help reducing the sympathetic activity; further reducing the myocardial oxygen uptake leading to reduction in ischemia. The vasodilatory effect of *Swedana* helps in peripheral vasodilation which is usually impaired in myocardial ischemia. The last step, *Basti* (per rectal administration of the herbs; *Tribulus terrestris*, *Curcuma longa*, and *Emblia officinalis*), helps in release of nitric oxide which acts as a coronary vasodilator. *Tribulus terrestris*, *Curcuma longa*, and *Emblia officinalis*, all three have certain cardioprotective benefits [13-15].

The present study findings showed a significant increase in the GLS score post IRP therapy thus indicating the beneficial effects of IRP. Also, there was an improvement seen in all the cardiac parameters, though the difference was not significant. In addition, there was a significant increase in the distance covered during the 6MWT post IRP therapy. All these findings show that post IRP, there is an improvement in cardiac function leading to a lesser risk of cardiovascular outcomes in T2DM patients.

Also, there was a reduction in the fasting as well as post prandial blood sugar post treatment, although the difference was not statistically significant. This could be one of the effects of the calorie controlled diet kit as the components in the diet are lower in carbohydrates and calories while high on protein and fiber content keeping the sugar levels in control; thereby reducing the cardiovascular complications which result as a consequence of hyperglycaemia induced by uncontrolled diabetes.

There is a huge healthcare burden on the economy of developing countries like India, wherein the adverse effects induced by the medications for treatment of T2DM and IHD lead to increased hospitalizations, decline in medicine adherence which further has an impact on morbidity and mortality [16]. A reduction in the concomitant allopathic medication was observed in our study; thus, indicating that the use of IRP and diet kit as an intervention along with standard of care led to an overall reduction in the dependency of concomitant allopathic medications showing a positive result.

Limitations

The sample size in the current study was quite small and thus, future large-scale studies are warranted to add to the evidence that IRP is a potent alternative treatment.

Conclusion

There was significant improvement in the GLS score, the distance covered after the 6MWT post IRP along with a considerable tapering in the dependency on allopathic medications. Therefore, IRP may serve as an effective and sustainable alternative to standard allopathic treatment of T2DM and IHD.

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Conflicts of interest

None

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