

## Ischemia Reversal Therapy as an add-on Therapy for Ischemic Heart Disease: A Pilot Study based on SPECT Myocardial Perfusion Imaging

Rohit S<sup>1</sup>, Jagdish H<sup>2</sup>, Chandrakant C<sup>2</sup>, Sujit N<sup>3</sup> and Rahul M<sup>4\*</sup>

<sup>1</sup>Madhavbaug Institute of Preventive Cardiology, Pune, Maharashtra, India

<sup>2</sup>Poona Hospital & Research Centre, Pune, Maharashtra, India

<sup>3</sup>Departments of Nuclear Medicine, Deenanath Mangeshkar Hospital, Pune, Maharashtra, India

<sup>4</sup>Department of Research and Development, Madhavbaug Cardiac Care Hospital, Raigad, Maharashtra, India

\*Corresponding author: Rahul M, Department of Research and Development, Madhavbaug Cardiac Care Hospital, Raigad, Maharashtra, India, Tel: +919821014716; E-mail: drrahul@madhavbaug.org

Received: February 27, 2020; Accepted: March 09, 2020; Published: March 16, 2020

Copyright: © 2020 Rohit S, et al. This is an open-access article distributed under the terms of the creative commons attribution license, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

### Abstract

**Introduction:** Treatment of atherosclerosis and ischemic heart disease is a yet unresolved mystery. Reversal of atherosclerosis is studied by intra vascular ultrasound. Effect of atherosclerosis regression on myocardial perfusion is studied by SPECT myocardial perfusion (SPECT-MPI). Ayurvedic therapy in the form “ischemia reversal programme” (IRP) was studied with SPECT-MPI to see its effect on myocardial perfusion.

**Methods:** The present open label study involved fourteen IHD patients who underwent IPR (21 IRP sittings) in Madhavbaug clinics, Maharashtra. The inclusion criteria was patients (aged between 40-70 years) with BMI >20 kg/m<sup>2</sup> and positive for stress test induced ischemia. However, patients with recent myocardial infarction/known hypo or hyper thyroidism/chronic kidney disorder were excluded. SPECT-MPI was performed at enrolment and after 21 IRP sittings. Additionally, VO<sub>2</sub> peak and time of ischemia after stress test were recorded.

**Results:** SPECT\_MPI results showed significant difference in Summed Stress Score [SSS] (baseline vs. post 21 IRP sittings, 13.5+10.3 vs. 10.7+10.1; p=0.01) as well as Summed Difference Score [SDS] (baseline vs. post 21 IRP sittings, 8.9+6.2 vs. 6.2+6.3; p=0.03) in IHD patients. Similarly an increase in VO<sub>2</sub> peak levels (baseline vs. post 21 IRP sittings, 12.8+5.7, vs. 19.4+7.8 and 23.6+6.0, post 25-30 IRP sittings) and time of ischemia in seconds (baseline vs. post 21 IRP sittings, 370.7+201.1 vs. 597.8+201.9 and 702.0+ 138.0, 30 days follow up) was recorded. Significant improvement post IRP (30.2+3.6, baseline vs. 32.7+3.5, post IRP sittings) was observed according to SAQ scores. However, ejection fraction score was not significantly changed post IRP vs. baseline.

**Conclusion and Interpretation:** Statistically significant improvement in myocardial perfusion after IRP in IHD patients is observed, depicting positive role of IRP in IHD management.

**Keywords:** Ischemia reversal therapy; SPECT-MPI; VO<sub>2</sub> peak

### Introduction

The Registrar General of India reported that IHD led to 17% of total deaths in 2001-2003, which increased to approximately 42% of total deaths in 2013 [1]. There is an urgent need for developing preventive measures and various treatments for management of the disease state in stable IHD patients.

It thereby becomes important to acknowledge the need for better diagnostic and/or prognostic modalities to direct the best of therapy to individual patients. Single-photon emission computed tomography myocardial perfusion imaging (SPECT-MPI) is known to top the list of non-invasive diagnostic tools that help to assess myocardial ischemia from obstructive coronary artery disease. The results also aid in directing correct type of therapy and may also predict which patient may respond to the chosen therapy [2-4]. The combination of allopathic treatment and traditional Indian medicine, i.e., Ayurveda is a promising approach for the treatment of IHD. However, there is a paucity of evidence-based studies related to Ayurveda in combination

with allopathic medicine in the treatment of stable IHD patients. Ischemia reversal program (IRP) is one such treatment modality designed to on the basis of Ayurvedic principles for management of stable IHD. IRP includes a combination of Snehana (oleation), Swedana (thermal vasodilation) and Basti (per rectal drug administration) administered in the same order. Additionally, herbs used at each of these steps may have an additional cardio-protective effect. This pilot study is a first attempt to find evidence to prove the efficacy of IRP in improving myocardial blood perfusion in stable IHD patients as assessed by SPECT-MPI.

### Research Methodology

#### Study design

The present open-label study screened IHD who were willing to undergo IRP therapy at Madhavbaug clinics in Maharashtra, India.

### Inclusion criteria

Patients in the age group between 40-70 years having the clinical diagnosis of known IHD were recruited in the study. Other parameters considered for inclusion in the study were patients with BMI >20kg/m<sup>2</sup> as well as with stress test positive for inducible ischemia.

### Exclusion criteria

Patients with recent myocardial infarction and/or known hypothyroidism or hyperthyroidism or chronic kidney disorder were excluded from the present study.

### Patient visit schedule

SPECT-MPI was performed from December 2016 to September 2017 at two centres namely Sushrut Hospital & Research Centre, Chembur and Deenanath Mangeshkar Hospital, Pune. The schedule of the patient visit at study site was as follows:

**a. Screening:** Stress test positive patient for inducible ischemia were sent for SPECT-MPI.

**b. Enrolment:** If the SPECT-MPI test was positive, then the patient was enrolled in the study.

**c. Treatment:**

- After the 1st SPECT-MPI enrolled patients were given 21 IRP sittings.

- After completion of 21 IRP sittings, the patients were sent for 2nd SPECT-MPI.

The current study was ethically conducted in accordance with the Declaration of Helsinki, and all patients provided written informed consent.

### Other study measurements

Following tests were performed in all patients:

- VO<sub>2</sub> peak measurement was obtained using cardiac stress testing
- Time of ischemia was performed using Modified Bruce Cardiac stress testing
- Seattle Angina Questionnaire (SAQ) was recorded telephonically by research coordinators.

### Statistical Analysis

Demographic data namely age and height is reported as Mean ± SD. The distribution of patients based on gender is reported as N (%). Also, the number of patients who had prior PCI or CABG is given as N (%), the primary and secondary endpoints are depicted as Mean ± SD. The change in these endpoints at baseline and after IRP was determined using paired t-test and p<0.05 was considered to be significant. Ischemic burden was calculated using the formula [(summed difference score/68 (maximal segmental score=4)] × 100 = percentage ischemic myocardium). The statistical analysis was performed using SPSS version 21.0.

### Results

The current study, 27 patients were screened but only 14 IHD patients were enrolled (Figure 1). The average age of study population

was 57.5 ± 7.1 years of which eight (57%) were males. Clinical history of enrolled patients is depicted in Table 1. All the patients completed 21 sittings of the IRP therapy. Complete compliance to study protocol was observed.

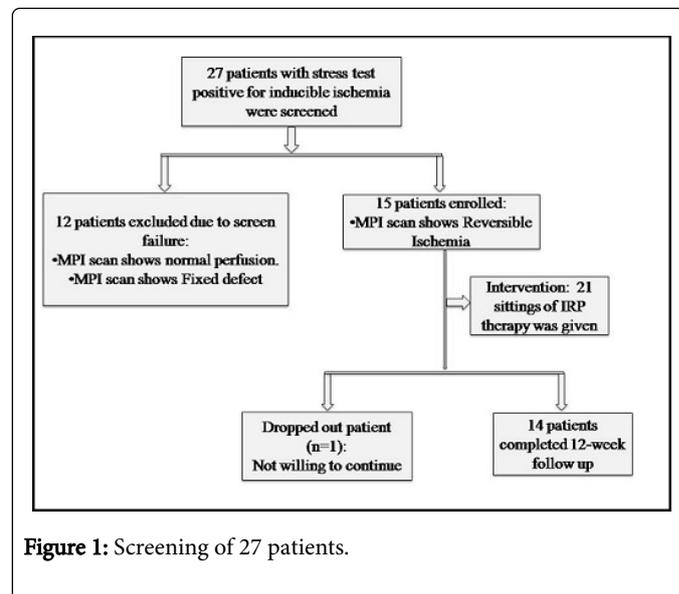


Figure 1: Screening of 27 patients.

The Summed Stress Score (SSS) and Difference Score (SDS) obtained after SPECT-MPI showed statistically significant improvement in myocardial perfusion after IRP as compared to baseline i.e., at the time of enrolment (Table 2). Figure 2 depicts one of the SPECT-MPI images showing improvement in myocardial perfusion after 21 IRP sittings as compared to baseline. The patients were further stratified based on their ischemic burden and a reduction in ischemic burden was seen in all the categories as depicted in Table 3.

The VO<sub>2</sub> peak levels and time of ischemia were observed to be increased showing improvement in cardiac muscle activity. The SAQ results also support the improvement in cardiac health (Table 2). However, the ejection fraction score was not found to be significantly changed post-IRP as compared with baseline.

Study group and Parameters		IHD patients N=14
Age (years)		57.5 ± 7.1
Sex	Female N (%)	6 (43%)
	Male N (%)	8 (57%)
Height (cm)		158.8 ± 8.7
Angiography, N (%)		6 (43%)
PTCA/ CABG, N (%)		3 (21%)

Table 1: Anthropometric and clinical parameters (expressed as mean ± SD).

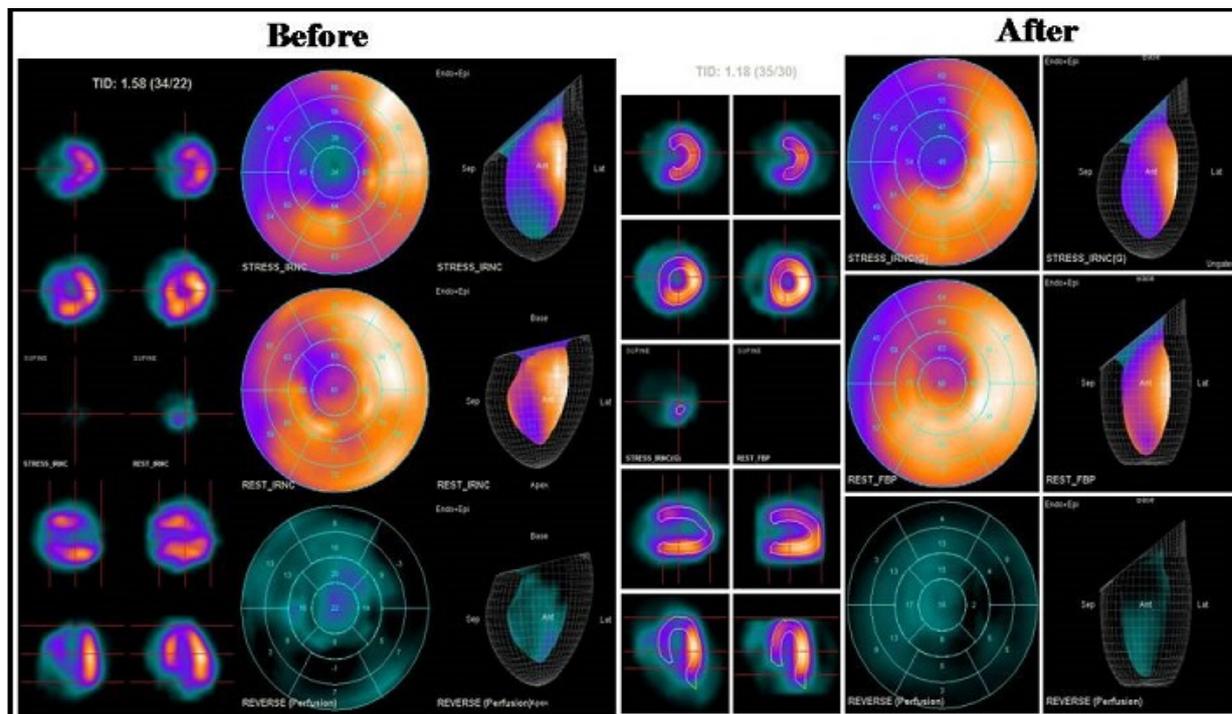


Figure 2: Depicts one of the SPECT-MPI images showing improvement in myocardial perfusion after 21 IRP sittings as compared to baseline.

Time and Parameters	Before IRP treatment	Post 21 IRP sittings
Summed Stress Score (SSS)	13.5 ± 10.3	10.7 ± 10.1 (p=0.01)
Summed Difference Score (SDS)	8.9 ± 6.2	6.2 ± 6.3 (p=0.03)
VO <sub>2</sub> peak levels	12.8 ± 5.7	19.4 ± 7.8
Time of ischemia in seconds	370.7 ± 201.1	597.8 ± 201.9
Seattle Angina Questionnaire (SAQ) scores	30.2 ± 3.6	32.7 ± 3.5

Note: A Patient is said to have positive change if there is reduction in SSS and SDS score (represents improved myocardial perfusion), Increased in VO<sub>2</sub> peak levels (represents maximum rate of oxygen consumption), Delayed time to ischemia and an improved SAQ score.

Table 2: Changes in the study parameters before and post IRP therapy.

## Discussion

This is the first alternative medicine study according to our knowledge reporting the beneficial effect of Ayurveda based therapy on myocardial perfusion in IHD patients as assessed by SPECT-MPI [5].

The study therapy, IRP includes three key panchakarma techniques namely snehana, swedana, and basti which by themselves have health benefits [6,7] but the current therapy also uses herbs in the form of oil and/or water-based decoction that is beneficial especially for cardiac health. Several studies have highlighted the coronary vasodilator and

anxiolytic properties of lavender oil used for Snehana [8,9]. Additionally, the herbs used in GHA kadha are known to be cardioprotective in nature. Numerous studies have reiterated that Gokshur (*Tribulus terrestris*) has nitric oxide driven vasodilatation effect; Haridra (*Curcuma longa*) is known for its anti-inflammatory action and Amalaki (*Phyllanthus emblica*) is an antioxidant that helps to reduce endothelial dysfunction [10-13].

SDS score*	No. of Patients	No. IRP sittings	Baseline		12-week follow up		p value
			SDS score	Ischemic Burden	SDS score	Ischemic Burden	
Overall	14	21	8.93 ± 6.24	13.13 ± 9.18	6.21 ± 6.33	9.14 ± 9.30	0.03
≥ 8.5	5		15.8 ± 4.66	23.24 ± 6.85	11.4 ± 6.43	16.76 ± 9.45	0.097
4-8.5	6		6.67 ± 1.21	9.80 ± 1.78	4.5 ± 4.89	6.62 ± 7.19	0.32
≤ 4	3		2 ± 1	2.94 ± 1.47	1 ± 1	1.47 ± 1.47	0.47

Note: \*The stratified SDS score gives a clear picture of improvement in three groups of patients based on their myocardial perfusion at baseline.

Table 3: Stratification of study population based on SDS Score and Ischemic Burden.

The present study used SPECT myocardial perfusion imaging for assessment of the effect of IRP on myocardial perfusion. SPECT MPI is

one of the best-known diagnostic and/ or prognostic techniques. Two well-known nuclear sub-studies namely COURAGE [14] and BARI-2D [15] used SPECT-MPI as a diagnostic tool and found it to be helpful in associating reduction in perfusion and efficacy of the treatment modalities namely medical therapy and revascularization used in these trials. The COURAGE sub-study reported added benefit of PCI as compared to optimal medical therapy alone. Further the results also pointed out the PCI may not be an effective treatment choice for patients with no to mild ischemic burden [14]. However, our study showed a beneficial effect of IRP even in patients with a low ischemic burden.

Additionally, an Asian study conducted in patients with IHD underlines utility of MPI for mortality risk stratification irrespective of ethnicity [16]. Another study also revealed the usefulness of SPECT MPI in the elderly population (50 to  $\geq$  80) in predicting cardiovascular events and accordingly choosing better treatment [17].

The importance of alternative and complementary therapies has been emphasized time and again for various heart diseases. One such study although using different treatment option namely cardiac rehabilitation program in addition to standard treatment also shows improvement in cardiac re-vascularization as shown by SPECT MPI [18].

## Conclusion

The present pilot study although with a small sample size shows positive role of IRP in IHD management. A future large trial is warranted to set a concrete foundation for including IRP as a mainstream IHD management therapy in addition to conventional treatment.

## Funding

Vaidya Sane Ayurvedic Education and Agricultural Trust.

## Previous Presentation

This data has been presented as poster presentation at Heart Failure 2018 & World Congress on Acute Heart Failure.

## Conflicts of Interest

Dr. RS and Dr. RM are employees of Vaidya Sane Ayurvedic Education and Agricultural Trust. Dr. JH, Dr. CC, Dr. SN have no conflict of interest to declare.

## Acknowledgments

The authors thank Poonam Pawar for writing assistance and editorial support for this manuscript. The authors thank the study participants and their families, without whom this study would not have been accomplished.

## References

1. Registrar General of India (2013) Report on Medical Certification of Report on Medical Certification of 2013.

2. Lugomirski P, Chow BJ, Ruddy TD (2014) Impact of SPECT myocardial perfusion imaging on cardiac care. *Expert Rev Cardiovasc Ther* 12:1247-1249.
3. Georgoulas P, Valotassiou V, Tsougos I, Demakopoulos N (2010) Myocardial perfusion SPECT imaging in patients after percutaneous coronary intervention. *Curr Cardiol Rev* 6: 98-103.
4. Acampa W, Gaemperli O, Gimelli A, Knaapen P, Schindler TH, et al. (2015) Role of risk stratification by SPECT, PET, and hybrid imaging in guiding management of stable patients with ischaemic heart disease: Expert panel of the EANM cardiovascular committee and EACVI. *Eur Heart J Cardiovasc Imaging* 16: 1289-1298.
5. Wade M, Li YC, Wahl GM (2013) MDM2, MDMX and p53 in oncogenesis and cancer therapy. *Nat Rev Cancer* 13: 83-96.
6. Williamson EM (2004) Scientific basis for Ayurvedic therapies. *J Ethnopharmacol* 91: 373.
7. Vinjamury SP, Vinjamury M, Sucharitakul S, Ziegler I (2012) Panchakarma: Ayurvedic detoxification and allied therapies-is there any evidence?. In *Evidence-based practice in complementary and alternative medicine*. Springer, Berlin, Heidelberg.
8. Shiina Y, Funabashi N, Lee K, Toyoda T, Sekine T, et al. (2008) Relaxation effects of lavender aromatherapy improve coronary flow velocity reserve in healthy men evaluated by transthoracic Doppler Echocardiography. *Int J Cardiol* 129: 193-197.
9. López V, Nielsen B, Solas M, Ramírez MJ, Jäger AK (2017) Exploring pharmacological mechanisms of lavender (*Lavandula angustifolia*) essential oil on central nervous system targets. *Front Pharmacol* 8:280.
10. Shukla V, Vashistha M, Singh SN (2009) Evaluation of antioxidant profile and activity of amalaki (*Emblca officinalis*), spirulina and wheat grass. *Indian J Clin Biochem* 24: 70-75.
11. Srinivas C, Prabhakaran KV (1989) Haridra (*Curcuma longa*) and its effect on abhisayanda (conjunctivitis). *Anc Sci Life* 8: 279.
12. Chhatre S, Nesari T, Kanchan D (2014) Phytopharmacological overview of *Tribulus terrestris*. *Pharmacogn Rev* 8: 45.
13. Fatima L, Sultana A, Ahmed S, Sultana S (2015) Pharmacological activities of *Tribulus terrestris* Linn: A systemic review. *World J Pharm Pharm Sci* 4: 136-150.
14. Shaw LJ, Berman DS, Maron DJ, Mancini GB, Hayes SW, et al. (2008) Optimal medical therapy with or without percutaneous coronary intervention to reduce ischemic burden. *Circulation* 117: 1283-1291.
15. Shaw LJ, Cerqueira MD, Brooks MM, Althouse AD, Sansing VV, et al. (2012) Impact of left ventricular function and the extent of ischemia and scar by stress myocardial perfusion imaging on prognosis and therapeutic risk reduction in diabetic patients with coronary artery disease: Results from the Bypass Angioplasty Revascularization Investigation 2 Diabetes (BARI 2D) trial. *J Nucl Cardiol* 19: 658-669.
16. Hori Y, Yoda S, Nakanishi K, Tano A, Suzuki Y, et al. (2015) Myocardial ischemic reduction evidenced by gated myocardial perfusion imaging after treatment results in good prognosis in patients with coronary artery disease. *J Cardiol* 65: 278-284.
17. Perrone-Filardi P, Cuocolo A, Dellegrottaglie S (2012) Myocardial perfusion imaging in very elderly patients with suspected coronary artery disease: Never too late!. *J Nucl Cardiol* 2012;19: 224-226.
18. El-Demerdash S, Khorshid H, Salah I, Abdel-Rahman MA, Salem AM (2015) Cardiac rehabilitation improves the ischemic burden in patients with ischemic heart disease who are not suitable for revascularization. *Cardiovasc Revascularization Med* 16: 280-283.