International Journal of Advances in Medicine
*Murumkar PS et al. Int J Adv Med. 2024 Nov;11(6):566-570*
http://www.ijmedicine.com
pISSN 2349-3925 | eISSN 2349-3933
DOI: https://dx.doi.org/10.18203/2349-3933.ijam20243059

**Original Research Article**

# Effect of ayurveda-based panchakarma and lifestyle modification on global longitudinal strain in cardiac disorder patients

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**Received:** 29 July 2024
**Revised:** 09 September 2024
**Accepted:** 10 September 2024

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## ABSTRACT

**Background:** The present sought to study the change in global longitudinal strain (GLS) after 90 days in known cases of cardiac disorders with Ayurveda based Panchakarma and lifestyle modification.
**Methods:** A retrospective, observational, single-centre study was conducted from July 2021 to April 2022 in Maharashtra, India. Patients aged 18 years and above, diagnosed with inducible ischemia on stress test who underwent the ischemia reversal program (IRP) included in this study. Follow-up was conducted at 90 days. Day 1 and day 90 data were compared.
**Results:** A total of 32 patients were assessed. Anthropometric variables such as weight (day1: 68.31±12.40 kg and day 90: 63.82±10.93 kg, p=0.00) and abdominal girth (day 1: 93.56±9.60 cm and day 90: 88.22±6.19 cm, p=0.00) improved at the 90-day follow-up. The lipid profile also improved for variables such as high-density lipoprotein (day 1: 27.66±2.69 mmol/l and day 90: 31.94±2.69 mmol/l, p=0.00), low-density lipoprotein (day 1: 146.88 ± 44.68 mmol/l and day 90: 102.00±9.10 mmol/l, p=0.00), and triglycerides (day 1: 206.03±43.41 mmol/l and day 90: 157.53±35.70 mmol/l, p=0.00). Vo2 max changed from 16.93 ± 7.87 ml/kg/min to 30.83±3.76 ml/kg/min, p=0.00). GLS improved from -14.08±3.79 to -16.35±3.26.
**Conclusion:** Panchakarma therapy and lifestyle modifications help in improving global longitudinal strain, reducing symptoms of chest pain, breathlessness, dyspnea on exertion, improved V02 peak and improved weight loss and ejection fraction.

**Keywords:** Ayurveda, Global longitudinal strain, Panchakarma, Vo2 max

## INTRODUCTION

Ischemic heart disease is the most prominent cause of morbidity and health burden in India. According to the global burden study, 15.4 million deaths were attributed to ischemic heart disease in 2017. Additionally, the disability adjusted life years (DALYs) lost due to ischemic heart disease amounted to 36.99 million. Mortality from this condition rose significantly from 0.85 million to 1.54 million in 2017. An upward trend in body mass index (BMI) was also noted during this period.[1] Pharmacotherapy is the primary treatment strategy for ischemic heart disease. Despite the development of newer drugs, traditional medications such as organic nitrates, beta-adrenergic blockers, calcium channel blockers, and potassium channel openers continue to be the first line of management.[2] However, the rising adverse effects associated with allopathic medicines necessitate the development of novel therapeutic options as well as alternative treatments.[3] Managing ischemic heart disease

is complex, involving various factors such as age, underlying comorbidities, and ongoing medications. ayurveda, the traditional medical system of India, is a holistic and complex approach to healthcare. Panchakarma, is a key ayurvedic treatment modality, used for internal cleansing. The beneficial effects of ayurveda-based therapies have been evidenced in numerous case reports.[4] Thus, the potential of ayurvedic treatments should be explored in combination to standard care. The Ischemia reversal program (IRP) is a combination of Panchakarma and allied therapy. The current study was designed to assess the change in global longitudinal strain (GLS) after 90 days in known cases of cardiac disorders with ayurveda based Panchakarma and lifestyle modification.

## METHODS

### *Study design*

A retrospective, single-centre study was conducted at Madhavbaug Ghatkopar West Clinic, Maharashtra, India.

Study duration

The study period was from July 2021 to April 2022.

### *Inclusion criteria*

Patients aged 18 years and above, diagnosed with inducible ischemia on stress test with complaints of chest pain, breathlessness, dyspnea on exertion with or without bipedal oedema were included in this study.

### *Exclusion criteria*

Patients with <15% ejection fraction, immunocompromised condition, any ongoing viral infection, or non-co-operative nature were excluded from the study. The study was conducted in accordance with the declaration of Helsinki,[5] Good clinical practice,[6] and applicable regulatory requirements.

### *Ischemia reversal program (IRP)*

The ischemia reversal program is a Panchakarma ayurveda-based therapy involving 3 steps. This procedure is performed on patients after a light breakfast. One session lasts approximately 65–75 mins. The first step, Snehana is centripetal oleation and involves a massage with 80% sesame oil and 20% Lavender fragrance for 20 mins with strokes directed towards the heart in a centripetal manner. The centripetal oleation improves cardiac output. The second step, Swedana is thermal vasodilation. It involves passive heat therapy using 15 ml Dashamool Kadha in a wooden box. The patient lies in a supine position with his/her neck protruding outside the box at temperature ranging 45–55°C for 10 –15 mins or til the time the patient can tolerate the heat. This reduces inflammation and causes the loss of excessive salts and water by sweating. The third step is per rectal drug administration for approximately 15 mins. This reduces lipid, water overload and oxidative stress of the body. The patients followed a diet plan of 1200 calories/day. The patients were also prescribed oral medication: Tab GHA and ARJ Kadha for a month.

### *Study endpoints and data collection*

The primary endpoint of the study was change in GLS score from say 1 to day 90. The secondary endpoint was improvement in ejection fraction, end diastolic volume, improvement in lipid profile, weight reduction, and reduction of allopathic medication. Data were retrospectively collected from patient medical records. Data such as age, gender, weight, abdominal girth, heart rate, cholesterol levels, and echocardiographic parameters were documented at day 1 and day 90. Data for day 1 were compared with data from day 90. Data was extracted only for patients that had completed at least 7 sessions of the IRP over a duration of 90±15 days. The patient records wherein complete treatment and follow up details were not available or treatment was changes were excluded from analysis. Adherence to medication on day 1 and day 90 were also noted and compared at follow-up.

### *Statistical analysis*

All patient data were collected and coded in a Microsoft Excel sheet. Software R 3.4.4 was used to analyze data. Continuous data are expressed as the mean±standard deviation, whereas categorical data are expressed as number (frequency). Paired t-test was used to analyze the difference in various parameters at day 1 and day 90. A p-value <0.05 was considered as statistically significant.

## RESULTS

### *Demographic, anthropometric, echocardiographic and lipid profile details of study population*

A total of 32 patients were included in this analysis. The mean age of the study population was 57.44±10.02 years and 27 (84.4%) males comprised the study population. Anthropometric variables such as weight (day1: 68.31±12.40 kg and day 90: 63.82±10.93 kg, p=0.00) and abdominal girth (day 1: 93.56±9.60 cm and day 90: 88.22±6.19 cm, p=0.00) improved at the 90-day follow-up. The lipid profile also improved for variables such as high-density lipoprotein (day 1: 27.66±2.69 mmol/l and day 90: 31.94±2.69 mmol/l, p=0.00), low density lipoprotein (day 1: 146.88±44.68 mmol/l and day 90: 102.00±9.10 mmol/l, p=0.00), and triglycerides (day 1: 206.03±43.41 mmol/l and day 90: 157.53±35.70 mmol/l, p=0.00) also improved. Vo2 max changed from 16.93±7.87 ml/kg/min to 30.83±3.76 ml/kg/min, p=0.00). Echocardiographic variables also improved. The demographic, anthropometric, echocardiographic and lipid profile details of study population are detailed in table 1. Vo2 max, weight, BMI, GLS, and ejection fraction

according to GLS classification is shown in Table 2. Vo2 max, weight, body mass index, GLS, and ejection fraction according to end diastolic volume classification is shown in Table 3. Vo2 max, weight, body mass index, GLS, and ejection fraction according to Vo2 max classification is shown in Table 4.

***Medication adherence***

Statins, beta blockers, and antiplatelets were the most commonly adhered to medications on day 1, but adherence dropped by 33.3%, 26.67%, and 6.67%, respectively by day 90.

**Table 1: Demographic, anthropometric, echocardiographic and lipid profile details of study population.**

| Variable | Patients, (n=32) day 1 | Patients, (n=32) day 90 | P value |
|---|---|---|---|
| **Age, years** | 57.44±10.02 | | |
| **Male, N (%)** | 27 (84.4%) | | |
| **Vo2 max, ml/kg/min** | 16.93±7.87 | 30.83±3.76 | 0.00 |
| **Weight, kg** | 68.31±12.40 | 63.82±10.93 | 0.00 |
| **Body mass index** | 26.29±3.48 | 24.09±2.99 | 0.00 |
| **Abdominal girth, cm** | 93.56±9.60 | 88.22±6.19 | 0.00 |
| **Heart rate, bpm** | 87.59±7.20 | 83.06±4.95 | 0.00 |
| **Total cholesterol** | 228.97±45.37 | 181.84±26.46 | 0.00 |
| **High density lipoprotein** | 27.66±2.69 | 31.94±2.69 | 0.00 |
| **Low density lipoprotein** | 146.88±44.68 | 102.00±9.10 | 0.00 |
| **Triglyceride** | 206.03±43.41 | 157.53±35.70 | 0.00 |
| **Global longitudinal strain** | -14.08±3.79 | -16.35±3.26 | 0.00 |
| **End diastolic volume** | 81.52±33.13 | 92.27±38.09 | 0.00 |
| **Stroke volume** | 33.68±12.48 | 40.84±14.40 | 0.00 |
| **Ejection fraction, (%)** | 50.94±11.82 | 51.59±11.48 | 0.00 |

All data are expressed as number (percentage) or mean±standard deviation.

**Table 2: Vo2 max, weight, body mass index, GLS, and ejection fraction according to GLS classification.**

| GLS classification | Vo2 max | | Weight | | Body mass index | | GLS | | Ejection fraction | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Day 1 | Day 90 | Day 1 | Day 90 | Day 1 | Day 90 | Day 1 | Day 90 | Day 1 | Day 90 |
| **4 to 6** | 5.00±0.00 | 25.00±0.00 | 68.30±0.00 | 60.30±0.00 | 26.20±0.00 | 24.10±0.00 | -5.0±0.0 | -8.3±0.0 | 35.00±0.0 | 35.00±0.0 |
| **6 to 10** | 9.67±5.91 | 26.47±0.41 | 60.40±18.14 | 55.80±14.31 | 22.00±5.60 | 19.61±3.32 | -7.97±0.38 | -11.57±0.19 | 26.67±10.27 | 29.33±8.22 |
| **10 to 15** | 18.46±6.32 | 32.08±2.88 | 72.03±11.61 | 67.73±10.13 | 27.44±3.20 | 25.33±2.66 | -13.08±1.48 | -15.54±1.82 | 50.63±8.64 | 51.44±9.43 |
| **15 to 22** | 17.71±8.64 | 30.74±4.10 | 65.32±10.28 | 60.91±9.20 | 25.83±2.06 | 23.57±2.07 | -17.70±2.15 | -19.30±1.77 | 58.75±4.15 | 58.75±4.15 |

All data are expressed as number (percentage) or mean±standard deviation.

**Table 3: Vo2 max, weight, body mass index, GLS, and ejection fraction according to end diastolic volume classification.**

| End diastolic volume classification | Vo2 max | | Weight | | Body mass index | | GLS | | Ejection fraction | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Day 1 | Day 90 | Day 1 | Day 90 | Day 1 | Day 90 | Day 1 | Day 90 | Day 1 | Day 90 |
| **Less than 90** | 17.26±7.94 | 31.23±3.91 | 66.72±11.05 | 62.49±9.68 | 26.3±+3.62 | 24.02±3.07 | -14.84±3.63 | -17.03±3.00 | 52.00±12.25 | 52.52±11.43 |
| **90-140** | 17.55±6.58 | 30.15±2.19 | 74.90±16.02 | 69.95±14.14 | 26.00±3.15 | 24.39±2.87 | -12.40±1.65 | -14.85±2.00 | 49.17±8.37 | 50.50±10.31 |
| **Above 140** | 5.00±0.00 | 25.00±0.00 | 68.30±0.00 | 60.30±0.00 | 26.20±0.00 | 24.10±0.00 | -5.00±0.00 | -8.30±0.00 | 35.00±0.00 | 35.00±0.00 |

All data are expressed as number (percentage) or mean±standard deviation.

**Table 4: Vo2 max, weight, body mass index, GLS, and ejection fraction according to Vo2 max classification.**

| Vo2 max Classification | Vo2 max | | Weight | | Body mass index | | GLS | | Ejection fraction | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Day 1 | Day 90 | Day 1 | Day 90 | Day 1 | Day 90 | Day 1 | Day 90 | Day 1 | Day 90 |
| **Low risk** | 23.07±4.45 | 32.86±3.10 | 68.71±9.71 | 65.02±8.50 | 26.44±2.75 | 24.31±1.92 | -15.00±3.35 | -16.64±2.92 | 49.41±12.11 | 49.59±11.77 |
| **Severe** | 6.86±2.31 | 26.88±1.36 | 60.23±9.36 | 55.73±7.00 | 24.21±3.83 | 21.66±2.57 | -13.22±4.85 | -16.16±4.47 | 51.11±13.08 | 51.44±12.43 |
| **Intermediate** | 14.65±1.55 | 31.00±3.17 | 79.28±14.24 | 72.55±13.44 | 28.95±2.75 | 27.12±3.01 | -12.75±2.04 | -15.82±1.33 | 55.00±7.07 | 51.50±5.59 |

All data are expressed as number (percentage) or mean±standard deviation.

**Table 5: Medication adherence.**

| Medicine name | Day 1 | Day 90 | Change% |
|---|---|---|---|
| **Statin** | 15 | 10 | -33.33 |
| **Nitrate** | 7 | 5 | -28.57 |
| **Beta-Blocker** | 15 | 11 | -26.67 |
| **Anticoagulant** | 13 | 12 | -7.69 |
| **Antiplatelet** | 15 | 14 | -6.67 |
| **Calcium channel blocker** | 3 | 3 | 0 |
| **Diuretic** | 5 | 5 | 0 |

## DISCUSSION

Global longitudinal strain is able to diagnose early changes in cardiac function due to ischemia. It is a sensitive marker for identification of subclinical myocardial dysfunction. the primary endpoint of the current study was change in GLS score from baseline to 90-day follow-up. The GLS score changed from -14.08±3.79 to -16.35±3.26. Other studies observed changes in GLS from -10.35±3.11 to -11.80±3.48 after 30 days 7 and -10.77% to -12.13% after 30 days.8 GLS also, correlates positively with Vo2 max. The current study observed an increased in Vo2 max score from 16.93±7.87 ml/kg/min to 30.83±3.76 ml/kg/min. This is in line with earlier studies that documented an increased from 20.29±6.72 ml/kg/min to 29.40±6.71 ml/kg/min,9 20.74±7.25 ml/kg/min to 29.69±6.62 ml/kg/min,10 17.82±7.23 ml/kg/min to 26.65±6.14 ml/kg/min,11 18.14±7.82 ml/kg/min to 27.88±7.31 ml/kg/min,12 15.57±7.54 ml/kg/min to 23.01±9.60 ml/kg/min,13 and 15.62±5.36 ml/kg/min to 26.51±5.93 ml/kg/min.[14]

The ischemia reversal program is a combination of Panchakarma and combination therapy. IRP comprises of a 3 Panchakarma steps such as Swedana, Snehana, and Basti. IRP is understood to work by reducing the sympathetic overload via Snehana's anxiolytic action, Swedana's reduction of sodium and water load, and Basti's assistance in releasing nitric oxide from vascular endothelium which is a coronary vasodilator apart from its antioxidant and anti-inflammatory properties through decoction.

The current study was limited by the retrospective and single centre study design. The small sample size also limits generalization to the overall population.

## CONCLUSION

Panchakarma therapy and lifestyle modifications help in improving global longitudinal strain, reducing symptoms of chest pain, breathlessness, dyspnea on exertion, improved V02 peak and improved weight loss and ejection fraction.

*Funding: No funding sources*
*Conflict of interest: None declared*
*Ethical approval: The study was approved by the Institutional Ethics Committee*

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**Cite this article as:** Murumkar P, Kulthe N, Ghadigaonkar P. Effect of ayurveda-based panchakarma and lifestyle modification on global longitudinal strain in cardiac disorder patients. Int J Adv Med 2024;11:566-70.