

Effects of Inspiratory Muscle Training with and without Resistance Training on Functional Capacity and Quality of Life in Patients with Phase II Cardiac Rehabilitation

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ABSTRACT

Background: Inspiratory muscle preparing is a protected mediation in early postoperative period which cause enhancements in utilitarian limit and respiratory muscle strength might lead patients to take part in exercises of everyday living.

Objective: The objective of study was to determine the effects of Inspiratory muscle training with and without resistance training on Functional capacity and quality of life in patients with phase II cardiac rehabilitation.

Methods: It was randomized controlled trial. Data was collected from Dr. Zia ul Rehman Heart Center, Chiniot. 20 subjects Aged between 40-60 years were randomized in this study design. Cardiac Patients, Undergoing Cardiac surgery Patients, Patients undergoing CABG at least 3 weeks prior and Presently non-smokers were included in the study. Clinical course without complications during hospital stay was scored on Glittre-ADL test and Minnesota living with heart failure questionnaire before and after end of treatment session. Upper and lower limb resistance training was performed for 20 minutes, with 3 sets of 10 repetitions.

Results: Independent sample t-test was applied to compare pre-treatment and post-treatment Minnesota Living with Heart Failure Questionnaire here was statistically significant difference between two groups with $P < 0.05$. Comparison of Glittre-ADL test within each treatment group applied paired sample t-test which showed statistically important variation for both groups ($P < 0.05$) with greater difference seen in group Inspiratory Muscle Training with Resistance Training. Comparison of MLHFQ within each treatment group applied paired sample t-test which showed statistically important variation for both groups ($P < 0.05$) with greater difference seen in group Inspiratory Muscle Training with Resistance Training.

Practical Implication: it was shown that CABG patients whose personal satisfaction, uneasiness, and sorrow were undeniably diminished subsequent to taking part in inspiratory muscle preparing.

Conclusion: Inspiratory muscle training with resistance training is more effective on functional capacity and quality of life in patients with phase II cardiac rehabilitation.

Keywords: Inspiratory Muscle Training, Resistance training, Functional capacity, Cardiac rehabilitation.

INTRODUCTION

Cardiac rehabilitation is becoming an established part of the standard of treatment for people with cardiovascular disease. Phase II (outpatient) cardiac rehabilitation may be beneficial for those who have recovered from a myocardial infarction, have stable angina, or have undergone coronary bypass surgery.^(1,2) After intense coronary disorder, like ST-rise myocardial dead tissue, non-STEMI, and temperamental angina pectoris, CR is suggested as a Class I mediation by the American School of Cardiology, the American Heart Affiliation, and the Japanese Course Society. Roughly 30%-60% of patients actually report routinely practicing following a half year, regardless of the way that it is generally recognized that continuous activity preparing is important to keep up with expanded practice resistance.⁽¹⁾ World health organization (WHO) characterized heart recovery as "the amount of exercises expected to impact well the hidden reason for the sickness and to guarantee the patient the most ideal physical, mental, and social circumstances with the goal that they may, independently, save or resume, as typical a spot in the existence of the local area as is conceivable" (World health organization, 1993).^(3,4) Phase 2 of cardiac rehabilitation often begins after hospital release or a few days following a cardiovascular incident. This phase seeks to preserve well-being and promote the return of social and professional activities. At this point, you may begin resistance training to build up your muscles and stave off weariness so you can get back to your regular routine and activities.⁽⁵⁾ Chronic heart failure, acute MI, peripheral arterial disease, angina pectoris and open heart surgery all are included in cardiac rehab.⁽⁶⁾ Indications for cardiac rehabilitation are:⁽⁷⁾ Infarction of the heart recently, Cardiovascular crisis brought on by sudden blockage of a major artery, Permanent, unchanging angina

and heart failure that's congestive, or CHF.⁽⁷⁾ Most outpatient CR units started the training phase CR (phase II CR) 2 to 4 weeks after STEMI. Depression is notoriously difficult to treat, thus ancillary strategies that aim to enhance patients' adherence to their prescribed medications might be useful if they fail to do so on their own.^(8,9) Supervised exercise under cardiac monitoring is included in the physical activity component, which generally spans 36 sessions over 12 weeks. Although not common, there are rigorous cardiac rehabilitation programmes that last up to 18 weeks and include of as many as 72 sessions.⁽¹⁰⁾ Most recent cardiovascular clinical practice guidelines suggest it as a class I therapy. cardiac rehabilitation therapies are grossly underused despite considerable morbidity and mortality benefits having been documented.^(11, 12) Outcome measures included electronic health record or registry registration for CR, inpatient and outpatient CR referrals, and inpatient and outpatient HF exercise training. Comprehensive CR is a process that should be implemented as soon as possible, continued without interruption, and communicated about adherence, enrollment, and outcomes.^(13, 14) CR exercise training is associated with decreased risk of stroke, invasive coronary intervention, hospitalization for either acute rejection or HF, and death.⁽¹⁵⁾ Evidence of low to intermediate quality suggests that CR decreases the risk of all hospital admissions and, perhaps, decreases HF-specific hospital admissions in the short run (up to 12 months).^(16,17) Inspiratory muscle brokenness is a known however perhaps undervalued result of cardiovascular illness that prompts dyspnea and exercise bigotry in such individuals. Inspiratory muscle preparing (IMT) works on practical limit and inspiratory muscle strength in patients with congestive cardiovascular breakdown (CHF), in this manner decreasing dyspnea and further developing endurance.⁽¹⁸⁾ IMT performed at

home for 6 weeks was found to be an effective and safe tool for reducing dyspnea and fatigue and improving the New York Heart Association (NYHA) functional classification.⁽¹⁹⁾ However, despite its potential to alleviate HF symptoms including dyspnea and inspiratory muscle fatigue, IMT is not as commonly utilized as it might be. This may be due to a lack of information about the therapy's impact on patients' ability to do daily tasks.⁽²⁰⁾ Inspiratory muscle training (IMT) is another form of exercise that has been demonstrated to be useful in the therapy of various disorders. IMT has been connected to positive effects on the autonomic nervous system (ANS). Inspiratory muscle training (IMT) is widely regarded as a therapeutically relevant, low-cost intervention in the context of rehabilitation.^(21, 22) Inspiratory muscle preparing, in any event, when applied for a brief period, may potentiate the impacts of joined high-impact and opposition preparing, turning into a basic and modest system for working on respiratory wellness.

Patients, physiotherapists, and other medical services experts can all profit from assessing the consequences of this examination to work on cardiovascular consideration. Patients in Stage II of cardiovascular restoration can profit from the discoveries of this concentrate by assisting with characterizing a better arrangement. Tracking down a more proficient technique to work on Useful Limit and Personal satisfaction in Heart patients can be helped by differentiating the impacts of Inspiratory Muscle Preparing with and without Obstruction Preparing. The motivation behind this study is to look at the impacts of Inspiratory Muscle Preparing and Opposition Preparing on Heart Patients' Useful Limit and Personal satisfaction.

MATERIALS AND METHODS

Study Design: Study design was randomized clinical trial (RCT).

Study Setting: Data was collected from Dr. Zia ul Rehman Heart Center, Chiniot.

Duration of Study: Study was completed within 10 months after approval of synopsis.

Sample Size: Total sample size was 20 with 10 participants allocated to each group.⁽²³⁾

Sample size to detect a significant difference between two means Wed Jan 5 18:13:29 2022

Total sample size was 20 with 10 participants allocated to each group.⁽²³⁾

Inputs	
Mean 1	516
Variance 1	114.8
Mean 2	502.4
Variance 2	112.8
Confidence level	0.95
Power	0.8
Ratio of sample sizes (n2/n1)	1
Tails	2
Results	Sample size
Sample size 1 (n1):	10
Sample size 2 (n2):	10
Total sample size (both groups):	20

10% Attrition rate was Considered.

Study Groups: Two groups were made and participants was allocated randomly

Group A: Inspiratory Muscle Training

Group B: Inspiratory Muscle Training with Resistance Training

Sampling Technique: Sampling technique was Convenience sampling technique

Inclusion Criteria: Aged between 40-60 Years old sedentary individuals.⁽²²⁾

Functional class II and III (New York Heart Association)

Patients Undergoing Cardiac surgery.

Patients undergoing CABG at least 3 weeks before start of study.

Presently non-smokers.

No other comorbidities (CKD, liver failure).^{24,28,29}

Exclusion Criteria:

Uncontrolled Hypertension

Unstable angina.

Myocardial infarction.

complex Arrhythmias.⁽²²⁾

Sever grade 4 chronic obstructive pulmonary disease.

Acute decompensated heart failure.

Cognitive disorder MMS<24.

Uncontrolled diabetes.^{24, 28,29}

Data Collection Tool:

Glittre-ADL Test: The Glittre-ADL consists of completing a circuit while carrying a weighted backpack (2.5 Kg for women, 5.0 Kg for men). The 10-m long circuit is laid out as follows: from a sitting position, the patient stands up and walks along a flat course, traversing a two-step staircase at the midpoint (17 cm high x 27 cm deep each step); after completing the second half, the patient moves three 1 Kg objects from a shelf at shoulder height to another one at waist height and then to the floor; then, the patient returns the objects to the bottom shelf and finally to the top shelf again; then, the patient walks back the way he came, climbing and descending the stairs, until reaching the starting point (chair) again; sits down and immediately begins the next lap. Patients were instructed to complete five laps on this circuit in the shortest time possible.⁽¹⁸⁾

Minnesota Living with Heart Failure Questionnaire: One of the most popular health-related quality of life surveys for heart failure patients is the Minnesota Living with Heart Failure Questionnaire (MLHFQ) (HF). It gives you an overall score as well as scores for the physical and emotional aspects of your life.⁽²²⁾

INTERVENTIONS: Resistance Training for Upper Limb: Ten minutes of stretching and relaxation following 20 minutes of opposition preparing for the arms (latissimus dorsi, biceps brachii, rear arm muscles brachii, deltoid, trapezius, pec major, pec minor, and rhomboid) with free weights (three arrangements of activities for each muscle bunch performed with 10 reiterations with the power acclimated to half of the heap of one most extreme redundancy - 1MR).

Resistance Training for Lower Limb: Exercises for the femoral quadriceps, hip adductors, and hip abductors using ankle weights or elastic bands for 20 minutes, with 3 sets of 10 repetitions for each muscle group, and the intensity set to 50% of 1MR, followed by 10 minutes of stretching and relaxation. (25)

Inspiratory Muscle Training: Training involved sitting still with a nasal clip-on while being instructed to breathe deeply from the diaphragm at a pace of 15 to 20 breaths per minute. The maximal inspiratory pressure (PImax) was tracked weekly and used to regulate the training load. At least three separate 1-minute intervals were used to reliably achieve maximum PI values via inspiration from residual volume. By repeating the identical procedures used during inspiration, we were able to calculate the maximum possible pressure exerted during expiration (PEmax). Both the PImax and PEmax maneuvers required the patient to maintain oral cavity retention of the mouthpiece during the inspiration and expiration phases, respectively.⁽²⁶⁾

Data Collection Procedure: After synopsis approval from the university ethical committee Riphah, patients were approached and selected depending on inclusion criterion. The first visit involved the following: Completed through case history, full physical examination. The participants were assessed through quality of life and functional capacity. Treatment was done according to the allocated groups. Deep breathing as common treatment was given to both groups. Inspiratory muscle training was applied in group A for 3 weeks at 5 days per week. Inspiratory muscle training and resistance training were applied in group B for 3 weeks at 5 days per week.

Follow up: The researcher reassessed the patient. Pre and post treatment visit the patient was assessed and screened through Glittre-ADL Test and Minnesota Living with Heart Failure Questionnaire. The researcher assessed the efficacy of inspiratory

muscle training and resistance training after treatment sessions as a part of objective assessment. All participants received a total of 15 rehabilitation sessions (5times/week for 3 weeks).

Data Analysis Procedure: The data was analyzed using SPSS for Windows software, version 23. Statistical significance was set at $P = 0.05$. Following tests was used:

Descriptive Statistics: Frequency tables, pie charts, bar charts were plotted to show summary of group measurements measured over time. After applying test of normality Shapiro wilks test data was normally distributed so parametric tests were used. Independent samples T-test was applied. Paired samples T-test was applied.

RESULTS

Total 20 patients, 10 in Inspiratory Muscle Training with Resistance Training and 10 in Inspiratory Muscle Training with Resistance Training group. In group A, the patients mean age were 48.00 years and in group B, mean age were 50.50 years.

Baseline measurement of outcome variables:

	Inspiratory Muscle Training (n=10)	Inspiratory Muscle Training with Resistance Training (n=10)	P value
	Mean ± SD	Mean ± SD	
Glittre-ADL test	238.40±12.37	237.00±13.28	0.810
MLHFQ	51.10±6.35	50.00±6.34	0.716

Using a P -value 0.05, the Glittre-ADL test and the MLHFQ at their respective pre-treatment baselines were similarly distributed throughout the two groups. With regards to the Glittre-ADL pre-treatment Mean SD, the Inspiratory Muscle Training group scored 238.40±12.37, whereas the Resistance Training group scored 237.00±13.28. Inspiratory muscle training has a mean pre-treatment MLHFQ Scale score of 51.10±6.35 whereas resistance training has a mean value of 50.00±6.34.

Between group comparisons of Glittre-ADL test:

Glittre-ADL test (sec)	Inspiratory Muscle Training (Mean± S.D) (n=10)	Inspiratory Muscle Training with Resistance Training (Mean± S.D) (n=10)	P-value
Pre-treatment	238.40±12.37	237.00±13.28	0.810
Post treatment	223.20±12.60	177.10±23.56	0.000

The value of the Glittre-ADL assessment was compared between the two groups both before and after therapy using an independent sample t-test. A statistically significant difference between the groups was discovered ($P=0.05$). The Glittre-ADL pre-treatment mean SD 238.40±12.37 is the Inspiratory Muscle Training group and 237.00±13.28 for the Inspiratory Muscle Training group that also included Resistance Training.

Between group comparison of Minnesota Living with Heart Failure Questionnaire (MLHFQ):

MLHFQ	Inspiratory Muscle Training (Mean ±S.D) (n=10)	Inspiratory Muscle Training with Resistance Training (Mean ± S.D) (n=10)	P-value
Pre-treatment	51.10±6.35	50.00±6.34	0.716
Post treatment	39.50±5.40	23.00±4.49	0.000

The two groups' MLHFQ values were compared before and after therapy using an independent sample t-test. A statistically significant difference between the groups was discovered ($p 0.05$). Inspiratory muscle training has a mean pre-treatment MLHFQ

Scale score of 51.10±6.35, whereas resistance training has a mean value of 50.00±6.34.

Within group comparisons for Glittre-ADL test:

Glittre-ADL test (sec)	Inspiratory Muscle Training (Mean± SD) (n=10)	Inspiratory Muscle Training with Resistance Training (Mean ± S.D) (n=10)
Pre- treatment	238.40±12.37	237.00±13.28
Post treatment	223.20±12.60	177.10±23.56
P-value	0.00	0.00

Table showing paired sample t-test comparisons of Glittre-ADL scores between treatment groups. Both groups had statistically significant variance (P -value 0.05), with a larger disparity being observed in the Inspiratory Muscle Training with Resistance Training group.

Within group comparisons for Minnesota Living with Heart Failure Questionnaire (MLHFQ):

MLHFQ	Inspiratory Muscle Training (Mean±SD) (n=10)	Inspiratory Muscle Training with Resistance Training (Mean ± S.D) (n=10)
Pre- treatment	51.10±6.35	50.00±6.34
Post treatment	39.50±5.40	23.00±4.49
p-value	0.00	0.00

Table showing paired sample t-test comparisons of MLHFQ between treatment groups. Both groups had statistically significant variance (P -value 0.05), with a larger disparity being observed in the Inspiratory Muscle Training with Resistance Training group.

DISCUSSION

A Functional capacity and quality of life in patients undergoing phase II cardiac rehabilitation were studied to determine the efficacy of inspiratory muscle training with and without resistance training. To complete the investigation, a comparative experimental study was carried out. Within this study design, 20 participants were randomly assigned. The Inspiratory Muscle Training with Conventional Physiotherapy group consisted of 10 individuals, while the Inspiratory Muscle Training with Resistance Training in Conjunction with Conventional Physiotherapy group also consisted of 10 subjects. The results of this randomized controlled trial showed that Inspiratory Muscle Training combined with Resistance Training improved patients' functional capacity and quality of life throughout phase II of cardiac rehabilitation more than Inspiratory Muscle Training alone. Short-term moderate-to-high intensity inspiratory muscle training (IMT) with combined training (CT) provided additional benefits in exercise capacity, inspiratory muscle strength, QOL, and antioxidant profile in patients after coronary artery bypass grafting surgery, according to a study by Tamires Daros Dos Santos.⁽²⁴⁾ Subjects in both groups showed significant improvement in the Minnesota living with heart failure questionnaire after. Therefore, both therapies contribute significantly to enhanced quality of life. Bárbara Maria did another study, and the findings suggest that patients who have undergone coronary artery bypass and are in phase II of cardiac rehabilitation may benefit from the inclusion of inspiratory muscle exercise, even if done for a short duration. We compared baseline data before and after an intervention, as well as data before and after Phase II of cardiac rehabilitation.⁽¹⁸⁾ The results of the current study show that the Inspiratory Muscle Training with Resistance Training group showed statistically significant improvement, with greater effects on QOL and Functional capacity than the Inspiratory Muscle Training group. Research was directed to decide the viability and wellbeing of activity-based restoration programs for heart patients, both alone and in mix with different mediations, and in contrast with a benchmark group that participated in no active work. No measurably huge contrast in wellbeing related personal satisfaction was found among the proof. A beneficial outcome on

the substitute result of actual activity limit was tracked down in the pooled information, yet the extent of the impact not entirely settled because of the modest number of patients and the moderate to extremely bad quality of the fundamental proof.⁽²²⁾ In contrast to the aforementioned results, this study found that Inspiratory Muscle Training with Resistance Training was more effective than Inspiratory Muscle Training exercises in improving functional ability. Within group analysis utilizing the paired t test showed that members treated with Inspiratory Muscle Preparing with Obstruction Preparing further developed in practical status essentially ($P>0.05$). Inspiratory muscle preparing has been displayed to rush strength and capability recuperation following coronary supply route sidestep joining (CABG), as was likewise displayed in an earlier exploration. What's more, it was shown that CABG patients whose personal satisfaction, uneasiness, and sorrow were undeniably diminished subsequent to taking part in inspiratory muscle preparing.⁽²⁷⁾ Medical resources, diagnosis, and treatment must improve in developing countries. There are limited resources: access to medical and health resources; knowledge about disease; awareness, trainings, and awareness about health. Health literacy is mandatory for any disease and facilitates the patients access to resources, databases, and trainings about the disease in print and electronic (hybrid) format.³⁰⁻³⁷

Unfortunately, the study was limited because it was only performed in one clinical environment. Short follow-up periods prevent research into the long-term effects of therapies. More randomized controlled trials examining the effects of resistance training and inspiratory muscle training in phase II cardiac rehabilitation are needed. Long-term follow-up is essential to glean insight into the results of both therapies, hence further research is needed into this area.

CONCLUSION

The study concluded that muscle training with resistance training have better effects ($P=0.00$) as compared to muscle training without resistance training ($P<0.005$).

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