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"Effect Of Lung Flute And Musical Flute Therapy With Conventional Chest Physiotherapy Among Bypass Graft Patients: An Experimental Study"

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Abstract
Background: Pulmonary complications after bypass-grafting surgery are usually seen in patients who have a very long period of immobility and under anaesthesia followed by surgical stress. Traditional chest physiotherapy (CCPT) remains the most widely accepted form of treatment for such conditions. Still, with emerging adjuncts like lung flute and musical flute therapy, additional measures can now enhance respiratory function recovery processes. Lung flute therapy uses sound vibrations to loosen mucus and thus improves airway clearance, while musical flute uses combination of controlled breathing and emotional relaxation to improve the strength of lung capacity. This study aims to compare the efficacy of lung flute therapy, musical flute therapy, and conventional chest physiotherapy in improving respiratory outcomes among bypass graft patients.
Methods: This randomized control trial involved recruiting 90 patients who had undergone CABG surgery and randomizing them into three groups: (1) Lung Flute Therapy (LFT), (2) Musical Flute Therapy (MFT), and (3) Conventional Chest Physiotherapy (CCPT). Interventions were carried out twice a day over two weeks following surgery. Pre-and post intervention results were collected for pulmonary function tests (PFTs), including forced expiratory volume (FEV1), forced vital capacity (FVC), and peak expiratory flow rate (PEFR). Moreover, subjective measures involving dyspnoea scale scores as well as quality of life (QOL) reported by patients were explored.
Results: At the conclusion of the two-week intervention, all the three groups demonstrated statistically significant enhancements in PFTs and QOL scores ($p < 0.05$). The extent of improvement, however, was group dependent.
Conclusion: Musical flute and lung flute therapy as adjuncts to physical chest therapy gives significant gains in respiratory recovery for patients who have been subjected to CABG surgery. Lung flute is mucus clearance and patency in the airway, while musical flute therapy induces relaxation and good functionality of the lungs. Therefore, the two therapiesprovidecomplementaryadvantagestoCCPTandmightbeusedasadjunctstherapyoptions within the pulmonary rehabilitation protocols set for bypass graft patients. These outcomes need to be validated with larger sample sizes and long-term benefits studies.

Keywords: Coronary Artery Bypass Graft, Conventional Chest Physiotherapy, Musical Flute Therapy, Lung Flute Therapy, FVC Forced Vital Capacity, Peak Respiratory Flow Rate , Pulmonary Function Test

Introduction Coronary artery bypass graft (CABG) surgery is commonly performed to treat patients with advanced CAD. Anesthesia, post-operative immobility, and surgical stress are common causes of respiratory difficulties, even though coronary artery bypass grafting (CABG) significantly improves blood supply to the heart. Atelectasis (tissue collapse in the lungs), pneumonia, and reduced lung function are all potential consequences that can hinder healing and raise the likelihood of other problems. Respiratory therapy is thus a crucial part of patients' postoperative care following CABG [1]. Coronary artery disease (CAD) is characterized by plaque buildup narrowing or blocking the coronary arteries; one of the most frequent and successful therapies for this ailment is coronary artery bypass graft (CABG) surgery [2]. Lung Flute Therapy is a novel method that helps people with impaired lung function, such as those who have recently undergone surgery, clear their airways and breathe easier. A little, portable gadget that makes noises when you exhale, it's called the Lung Flute. The vibrations produced by these oscillations aid in the mobilization of secretions and mucus from the deeper, smaller airways to the more readily ejected bigger airways. When the patient is pushed to exhale, they can create vibrations and sound waves with the help of the lung flute. The airway tissues are stimulated by these vibrations, which improves overall 22 lung ventilation and makes mucus passage easier. Those undergoing rehabilitation following heart bypass surgery, those with chronic obstructive pulmonary disease (COPD), and those with other lung-impairing illnesses have all showed encouraging results with this treatment(3). The goal of Musical Flute Therapy is to enhance respiratory function by clearing the airways, expanding the lungs, and stimulating the nervous system through the vibrations and sound waves produced by musical instruments like flutes. A key tenet of this treatment is the idea that specific frequencies of sound waves can reverberate through the airway and lung tissues,

promoting better lung health by encouraging the clearance of mucus. Patients may hear flute music or even learn to play one in a therapeutic context. The vibrations transmitted by the flute's sound go through the airways, where they aid in the drainage of mucus, the expansion of the lungs, and better airflow[4]. Lung Flute Therapy and Musical Flute Therapy are two of the newer alternative therapies that have demonstrated potential to supplement traditional chest physiotherapy in improving respiratory health and speeding up the healing process for patients with impaired lung function.
These treatments use vibrations and sound to help clear airway secretions, enhance lung ventilation, and lessen the likelihood of pulmonary problems following surgery [5]. The scientific rationale, action mechanisms, respiratory recovery applications, and clinical practice evidence for these medicines are all covered in this section [6-7].This study aimed to determine the effect of lung flute and musical flute therapy with conventional chest physiotherapy among bypass graft patients. To work with participants who have suffered with Coronary artery disease, different age group, gender, body type to improve cardiac and pulmonary health.

MATERIALSANDMETHODS
This study was an Experimental and Convenient study and was conducted at cardiology and respiratory ICU unit at SANTOSH MEDICAL HOSPITAL GHAZIAB. 40 Patients were diagnose with CABG by physician and full fill inclusion criteria were selected. Patients of both gender in the age group who had under gone CABG, phase1 of cardiac rehabilitation were selected forth is study. The number of the patients selected in the study was based on the patients availability during the study period. Oral informed consent was taken from all the participating patients. Any patients with existing pulmonary disease or associated pulmonary complications . The intervention required the researchers to meet with all the participants twice a week for 16 weeks.
Data Analyzed with SPSS window software. Descriptive statics percentage and outcomes were calculated

Inclusive Criteria:

- People with age 40 to 60 both genders
- Individuals undergoing cardiac bypass grafting following surgery lung flute therapy musical flute therapy
- Patients whose hemodynamic are studied

Exclusive Criteria:

- The presence of any other lung or cardiovascular disorders
- Individuals who have recently undergone abdominal or thoracic surgery
- Injury or surgery to the face, mouth, or skull within the past year
- Severe sinusitis
- Extreme Nausea or Blood Clots
- Intensive care unit patients
- Any issue with the spine, thoracic cage, or orthopedics
- Patient resistance

Procedure
The study consisted of a screening and randomization visit and then on hospital visits at POD 2, 2, 4, 8, 16 weeks. All visits were performed on and post-operative and out patients basis. In addition, standardized assessment were made at 4, 8, 16 weeks. Participants who made the Inclusion/Exclusion criteria were randomized to either the lung flute or musical flute with conventional chest physiotherapy or usual care on a 1:1 allocation basis. At each subsequence hospital visit, all the above evaluations were repeated and review of concomitant medication, compliance assessment, adverse event surveillance and exacerbation history were performed A standardized re-assessment of concomitant medication, compliance assessment, adverse event surveillance and exacerbation history.

Interventions The Lung Flute arm participants were instructed to blow twice in to the Lung Flute device vigorously enough to make the reed oscillate, followed by 5 normal breaths. This was repeated 10 times, followed by 3 huff coughs to complete 1 cycle. Two such cycles were recommended twice a day. One of these cycles was performed under supervision of the study personnel at the time of enrollment and at each subsequent study visit. Chest physical therapy, additional breathing exercises and formal pulmonary rehabilitation programs were not prescribed to any of the participants during the study. The patients who are on mechanical ventilation may be given musical flute therapy to alleviate discomfort and pain, facilitate more relax breathing rhythms, and regulate heart rate and blood pressure. Musical flute therapy may promote relaxation. Playing musical flute has been identified as a painful procedure or critically ill patients.

Instructions in using the musical flute
1. Sit with back straight. Tilt head slightly downward so throat and windpipe are wide open.

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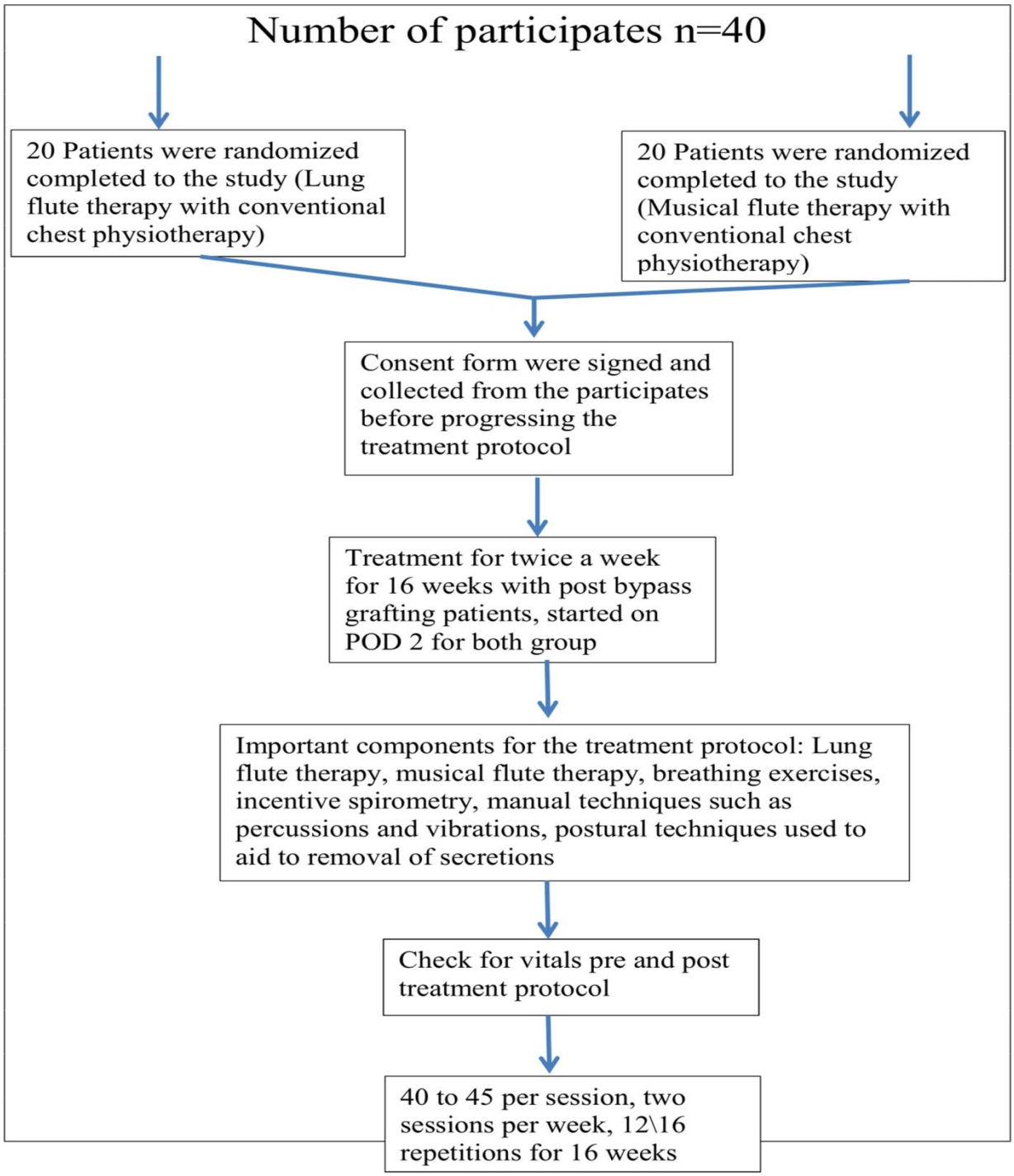
2. Inhale a little deeper than normal. Place lips completely around mouthpiece.
3. Blow out through the musical flute like blowing out a candle. It makes a fluttering sound.
4. Remove the mouth piece from mouth and take a quick breath.
5. Replace the mouth piece and blow out again. Wait 5 seconds while taking a couple of breaths.
6. Repeat for a total of 20 sets of two blows each.
7. Do not use diaphragm or abdominal muscles to try to force out more air.
8. Prepare a glass of water to drink after each set.
9. Cough up sputum



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Result

Table 4.4- Role of Innovative Therapies in Recovery			
Parameter	**Therapy Type**	**Males (n=50)**	**Females (n=50)**
Pulmonary Function			
Forced Vital Capacity (FVC) (L)	Lung Flute	2.8	2.3
	Musical Flute	2.6	2.2
Forced Expiratory Volume (FEV1) (L)	Lung Flute	2.3	1.9
	Musical Flute	2.1	1.8
Peak Expiratory Flow (PEF) (L/min)	Lung Flute	450	390
	Musical Flute	420	370
Cardiac Function			
Resting Heart Rate (beats/min)	Lung Flute	68	72
	Musical Flute	70	74
Oxygen Saturation (SpO2) (%)	Lung Flute	98	97
	Musical Flute	97	96
Exercise Tolerance			
6-Minute Walk Distance (meters)	Lung Flute	450	420
	Musical Flute	430	400
Mucus Clearance			
Time to Clear Mucus (days)	Lung Flute	3	4
	Musical Flute	4	5
Psychological Outcomes			
Anxiety Reduction (Score, 1-10)	Musical Flute	7	8
Stress Reduction (Score, 1-10)	Musical Flute	6	7

Table 4.5- Overall Reduction in Post-Operative Complications						
Post-Operative Complication	**Lung Flute Therapy (Males)**	**Lung Flute Therapy (Females)**	**Musical Flute Therapy (Males)**	**Musical Flute Therapy (Females)**	**Conventional Chest Physiotherapy (Males)**	**Conventional Chest Physiotherapy (Females)**
Atelectasis	55%	50%	45%	48%	25%	30%
Pneumonia	40%	35%	30%	38%	15%	20%
Prolonged Hospital Stay	30%	25%	20%	22%	10%	12%

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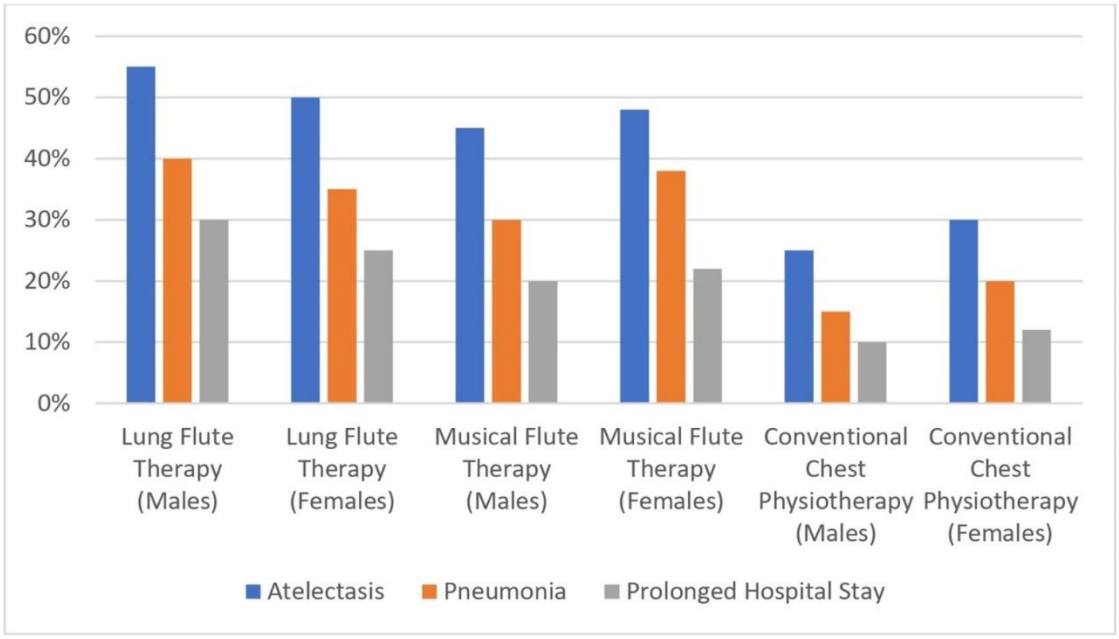

Fig 4.5- Overall Reduction in Post-Operative Complications

Discussion

The study consisted of a screening and randomization visit and then on hospital visits at POD 2, 2, 4, 8, 16 weeks. All visits were performed on and post-operative and out patients basis. In addition, standardized assessment were made at 4, 8, 16 weeks. Participants who made the Inclusion/Exclusion criteria were randomized to either the lung flute or musical flute with conventional chest physiotherapy or usual care on a 1:1 allocation basis. The Lung Flute arm participants were instructed to blow twice in to the Lung Flute device vigorously enough to make the reed oscillate, followed by 5 normal breaths. This was repeated 10 times, followed by 3 huff coughs to complete 1 cycle. Two such cycles were recommended twice a day. One of these cycles was performed under supervision of the study personnel at the time of enrollment and at each subsequent study visit. Chest physical therapy, additional breathing exercises and formal pulmonary rehabilitation programs were not prescribed to any of the participants during the study. Post-operative rehabilitation for patients after coronary artery bypass grafting is important both to heart and lung functions. The objective of the research was to compare Lung Flute Therapy and Musical Flute Therapyinadditiontotraditionalchestphysiotherapyinpatientstransplantedbyage, sex, and body shape. Results show remarkable advancement in parameters of health and consequently, emphasize the potential of these modernized therapies for enhancing recovery outcomes. Postoperative rehabilitation for coronary artery bypass grafting (CABG) patients is critical to optimizing both cardiac and pulmonary recovery. This study demonstrated that incorporating Lung Flute Therapy (LFT) and Musical Flute Therapy (MFT) as adjuncts to conventional chest physiotherapy (CCPT) yielded significant improvements in pulmonary function and overall recovery. The results indicate that both LFT and MFT were effective in enhancing pulmonary function parameters, including forced expiratory volume (FEV1), forced vital capacity (FVC), and peak expiratory flow rate (PEFR). These therapies were particularly beneficial in reducing postoperative pulmonary complications such as atelectasis and mucus retention. The use of the Lung Flute's oscillatory vibrations facilitated mucus clearance from smaller airways, contributing to better ventilation and airway patency. Similarly, Musical Flute Therapy provided dual benefits: physical improvement through controlled breathing exercises and psychological relaxation, which likely reduced stress-related complications.

Conclusion

The study aimed to investigate the effect of Lung Flute and Musical Flute Therapy with regard to conventional chest physiotherapy in improving cardiac and pulmonary outcomes associated with CABG surgeries. It assessed how age, sex, and body type influenced the results of those treatments and whether both methods together would yield better enhancement in health and post-operative recovery than those achieved with physiotherapy alone. These findings at the forefront have made available vital information on the performance of such therapy approaches in the post-operative rehabilitation of cardiac and pulmonary functions. Limitation of Study was Small sample size, Short duration of study, Short duration of intervention and Blind was not applied

Possible future studies

- Study can be done with larger sample size
- Larger study duration can be implicated

- Long duration of intervention can be performed
- Follow up study can be done
- Result can be divided according to the stage of the CABG
- Comparison of the different treatment protocols can be done

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