

Correlation Between Kinesiophobia and Functional Capacity In Phase II Coronary Artery Bypass Graft Patients

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ABSTRACT

Background: Coronary Artery Bypass Graft surgery (CABG) remains the most performed cardiac surgery worldwide. Fear of movement (Kinesiophobia) after cardiac surgery is associated with physical activity and non-adherence to cardiac rehabilitation. It is observed that functional capacity is significantly reduced after cardiac surgery. Long term Kinesiophobia leads to avoidance behaviours and hampers the physical levels and leads to deconditioning.

The aim of the study was to find out the Correlation between Kinesiophobia and Functional Capacity in Phase II Coronary Artery Bypass Graft patients.

Subjects and Methods: 50 CABG patients in Phase II were included in the study. The Tampa Scale of Kinesiophobia- Short Version Heart (TSK-SV Heart) and Six Minute Walk Test were done in the CVTS-OPD. The Spearman rho correlation was done to find a correlation between Kinesiophobia and Functional Capacity.

Results and Observations: It was observed that there was no correlation between TSK-SV Heart score (Kinesiophobia) and percent predicted value of 6MWT (Functional Capacity) with $r = 0.099$ and $p \text{ value} = 0.494$. However, the mean of the total TSK-SV Heart score was 41.1 ± 4.743 which was high and 88% of the population reported high Kinesiophobia (score > 37).

Conclusion: The results of the study showed no correlation but patients did report high Kinesiophobia and thus it should not be underestimated during cardiac rehabilitation. The possible reasons for high Kinesiophobia could be lack of awareness about the safety and level of physical activity, over-protective care givers, lack of attendance to cardiac rehabilitation post discharge, anxiety, and depression.

KEY WORDS: Coronary artery bypass graft, Kinesiophobia, Functional Capacity, Cardiac Rehabilitation.

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INTRODUCTION

Kinesiophobia is defined as 'an excessive, debilitating, irrational fear of movement and activity, resulting from a feeling of vulnerability to painful injury or re-injury'[1]

Kinesiophobia includes three components-

Threatening stimulus, increased sympathetic arousal and defensive behaviour [2]. Two major events are expected to develop Kinesiophobia- 'Past experience of pain or trauma': Having a painful experience in past associated with pain followed by a specific

activity and 'Social learning and observation': developing a thinking of movement related pain by observing others having a painful experience [3].

Long term Kinesiophobia leads to avoidance behaviours thus, further contributing to decreased physical capacity. Evidence for Kinesiophobia suggest that it is an important risk factor for cardiac events. A recent study shows that 43% of patients suffer from anxiety and fear of movement at the time of acute cardiac hospitalization and 28% after acute cardiac hospitalization [4-6].

It is observed that functional capacity is significantly reduced after cardiac surgery. This is due to post median sternotomy respiratory complications, reduced respiratory and peripheral muscle strength, lack of physical activity, incisional pain, fatigue, perceived exertion and emotional factors like anxiety and depression [7].

Coronary Artery Bypass Graft surgery (CABG) remains the most performed cardiac surgery worldwide. A cardiovascular disease may be terrifying and thus can pose as an existential threat that may alter patients' goals and quality of life [8]. Following any acute cardiac episode like myocardial infarction, a number of patients have shown to be fearful of movement and exercise [9]. Kinesiophobia combined with catastrophizing behaviour results in maladaptive avoidance behaviour, resulting in physical inactivity, disability, and depression [10]. According to a study by Back M, 20% of individuals with coronary artery disease have Kinesiophobia six months after their coronary incident [11]. Lower levels of physical activity and poor attendance to cardiac rehabilitation facilities had a detrimental impact on clinical factors crucial to rehabilitation outcomes and prognosis in the secondary prevention of coronary artery disease when Kinesiophobia was present [12]. Cardiac Rehabilitation begins in the hospital itself and extends indefinitely into the maintenance phase. The inpatient phase of Cardiac Rehabilitation is the Phase I. Out-patient Phase includes Phase II which is the Exercise training period, Phase III which is the intermediate out-patient phase and Phase IV

is the Maintenance Phase [13].

Phase II of the Cardiac Rehabilitation generally lasts 3 to 6 weeks after discharge [14]. It primarily aims at assessing limitations to physical function, restrictions of participation secondary to comorbidities and limitations to activities. A patient-centred therapy plan is designed that includes patient education, exercise training program and a relaxation program. The treatment phase intends to promote independence and instil lifestyle changes in an attempt to prepare patients to return to their basic and instrumental activities of daily living.

Kinesiophobia and its impact on Functional capacity have been studied in various conditions. Limited literature is available regarding its correlation with Functional Capacity in Phase-II Coronary Artery Bypass Graft patients.

With the help of this study, we will be able to find out the Correlation between Kinesiophobia and Functional Capacity in Phase II Coronary Artery Bypass Graft patients.

So, Fear Avoidance strategies and importance of structured exercise program can be emphasized to improve Functional Capacity, overall health, quality of life and secondary prevention in Coronary Artery Bypass Graft patients.

METHODS

This was a Cross sectional, Correlation, Observational study conducted in Cardiovascular and Thoracic Surgery Out-Patient Department, Tertiary Health Care Hospital. Permission was taken from the Head of the Cardiovascular and Thoracic Surgery Department (CVTS) and approval taken from the institutional ethics committee and MUHS before starting the study.

50 CABG patients who were 4 weeks post-surgery (Phase II) were included in the study. Participants with congenital heart disease, valve replacements, pacemakers, unhealed graft site, unable to comprehend and understand, any psychological illness, major auditory-visual impairments, major post-operative complications, major musculoskeletal or neurological conditions, requiring assistive aids for

walking, not willing to participate were excluded from the study. Participation in the study was voluntary. The reason for immediately stopping the 6MWT included intolerable dyspnea, leg cramps, staggering, diaphoresis, pale or ashen appearance, unwillingness, and chest pain.

Case record form was filled which included basic demographics details, anthropometric measures, vital parameters, comorbidities, and current medications. Kinesiophobia was assessed using the Tampa Scale of Kinesiophobia Heart (TSK-SV Heart). The scale has 17 items regarding injury or re-injury and fear avoidance behaviour during activities. Each item has 4 scores ranging from 1- strongly disagree to 4- strongly agree. While calculating the total score, the score of items 4, 8, 12, 16 are inverted. The total score ranges from 17 to 68. The score > 37 implies high level of Kinesiophobia while score < 37 implies low level of Kinesiophobia. TSK-SV Heart has been used as a tool to effectively measure Kinesiophobia in patients after cardiac surgery.⁽¹⁵⁾ Psychometric properties of the scale are Reliability- 0.77, Construct validity- 0.92, Intra-class coefficient- 0.83, internal consistent- 0.78⁽¹⁶⁾ Permission to use the scale was granted by the author.

Following this, the vitals of the participants were measured and 6MWT was done on the same day to assess the functional capacity. The test was conducted using the standardized procedure according to the guidelines of American Thoracic Society.⁽¹⁷⁾ It is a safe, reliable and sub maximal test. It is feasible and well tolerated in adult and older patients shortly after cardiac surgery.

Statistical Analysis:

SPSS software version 16 was used to analyse the data. The data was tested for normality using the Shapiro Wilk Test. The data was found to be normally distributed. Since, the Tampa Scale of Kinesiophobia Heart (TSK-SV Heart) is a four-point Likert scale, hence Spearman’s rho correlation was done. The confidence interval was set as 95% and significance level at 0.05. The data was considered significant if p < 0.05.

RESULTS

Total 50 participants were included in this study, out of which 32 (64%) were males and 18 (36%) were females. Mean Age was 55.5 ± 8.212 years. Mean BMI was 25.04 ± 3.0915 kg/m². Participants had comorbidities. Participants having Diabetes Mellitus were 26 %, Diabetes Mellitus with Hypertension were 34%, Hypertension were 14% and 26% had no comorbidities. The Rate of Perceived Exertion on Borg’s Scale at rest was 6.08 ± 0.2074.

The TSK-SV Score for Kinesiophobia as seen in Table No 1 and 2 and Graph 1 and 2 show that 88% participants had High level of Kinesiophobia and 12% had Low level of Kinesiophobia. Mean of the total TSK-SV Score was 41.1 ± 4.743.

Functional Capacity (percent predicted) as seen in Table 3 and Graph 3 show mean of Functional Capacity (% predicted) of 62.101 ± 15.075 % of patients post CABG.

The r value is 0.099 between Kinesiophobia Score and percent predicted value of 6MWT (Functional Capacity) which shows No Correlation and is seen in Table No 4 and Graph No 4.

Table 1: TSK-SV Heart Score

TSK-SV Heart Score	
Minimum	29
Maximum	53
Range	24
Mean	41.1
Std. Deviation	4.743
Std. Error of Mean	0.67
Lower 95% CI of mean	39.751
Upper 95% CI of mean	42.448

Graph 1: TSK-SV Heart score

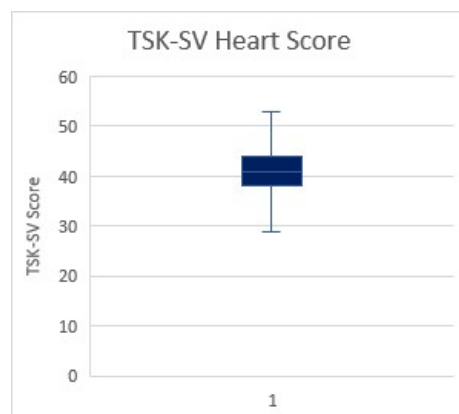


Table 2: Percentage distribution of TSK-SV Heart.

Interpretation	Frequency	Percentage
High	44	88
Low	6	12
Total	50	100

Graph 2: TSK-SV Heart Interpretation.

TSK-SV Heart Interpretation

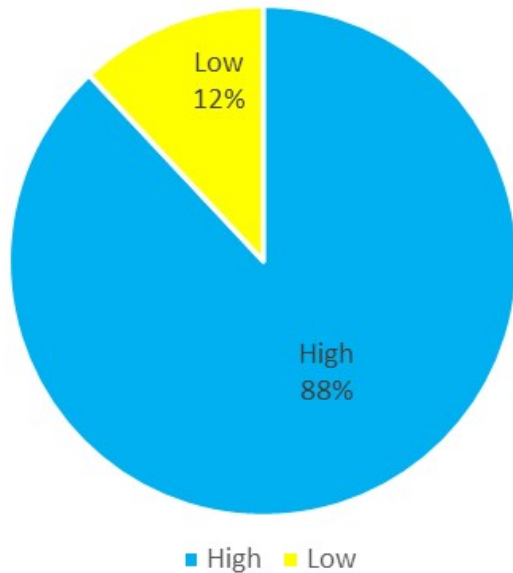
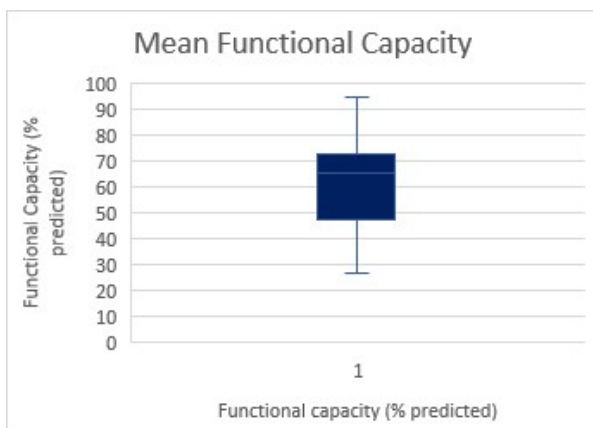


Table 3: Functional Capacity Parameters.

	Distance walked (meters)	Predicted Distance (meters)	Functional Capacity Percent Predicted (%)
Minimum	120	454.373	26.411
Maximum	480	550.573	94.635
Range	360	96.2	68.224
Mean	315.8	508.476	62.101
Std. Deviation	77.089	21.814	15.075
Std. Error of Mean	10.9	3.084	2.131
Lower 95% CI of mean	293.891	502.276	57.816
Upper 95% CI of mean	337.708	514.675	66.385

Graph 3: Functional Capacity.



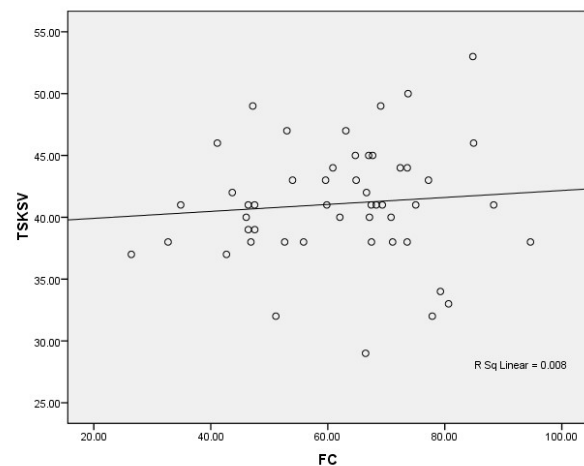
Correlations

Spearman's rho

Table 4: Correlation between Kinesiophobia and Functional Capacity.

Correlations Spearman's rho		
	TSKSV	FC
TSKSV	Correlation Coefficient	1
	Sig. (2-tailed)	0.494
	N	50
FC	Correlation Coefficient	0.099
	Sig. (2-tailed)	0.494
	N	50

Graph 4: Correlation between Kinesiophobia and Functional Capacity.



DISCUSSION

To the best of our knowledge this is the first study to focus on correlation between Kinesiophobia and Functional capacity in Phase II CABG patients. The primary finding of the study showed no correlation between Tampa Scale of Kinesiophobia (TSK-SV Heart) and Percent predicted value of Six Minute Walk Test (Functional Capacity) in Phase II Coronary Artery Bypass Graft patients.

In our study, 88% participants had High level of Kinesiophobia and 12% had Low level of Kinesiophobia. Mean of the total TSK-SV Score was 41.1 ± 4.743 . This rate is higher than found in the study by Megha Joshi et al (2020) [15].

The cause of Kinesiophobia in patients after Coronary Artery Bypass Grafting is uncertainty about level of activity to be done, over protective care-givers, lack of attendance to post discharge cardiac rehabilitation. Many of the patients were not aware about the safety of physical activity after cardiac surgery and

hence showed high level of Kinesiophobia. The level of Kinesiophobia must have been lower than pre-surgery or immediately after surgery but still one month post CABG, the level of Kinesiophobia was seen to be high. The impact of over-protective caregivers on cardiac surgery can be supported by a systematic review by Bjørnnes AK, Moons P, Parry et al (2019) which states that care givers worry about escalating the patient's symptoms and thus lack proper information about care during discharge [16]. This contributes to a heavily guarded behaviour chronically leading to Kinesiophobia.

The Kinesiophobia occurring in patients after cardiac surgery is associated with fear of movement, of general fitness exercise and mental as well as physical discomfort. Thus, anxiety may contribute to the presence of Kinesiophobia. Kinesiophobia can occur due to anxiety of pain, fatigue and exhaustion [17]. Fatigue is often a major and persistent problem for patients after cardiac surgery. The presence of fatigue after Coronary artery bypass graft may adversely affect the patient's recovery and quality of life. Patients who undergo surgery, including cardiac surgery, tend to experience fatigue that peaks between 2- to 4-weeks postoperatively [15].

In the first 6-months after surgery, fatigue had the greatest interference on physical activity and quality of life among CABG patients. This chronically leads to avoidance behaviour in an attempt to alter activities that cause fatigue thus, reducing activity pace or stopping the activity. Thus, Fatigue not only is a limitation to the patient's physical activity but also a constant reminder of the heart condition leading to fear of movement.

Studies have shown that attendance to cardiac rehabilitation have shown significantly reduced Kinesiophobia levels in Phase I of rehabilitation [16]. The benefit of phase I is that the training program occurs when the patients is admitted in the hospital setup with session from the physiotherapist. Once the patient gets discharge, it becomes practically impossible to attend an out-patient setup for rehabilitation without a care-giver. Thus, the attendance to cardiac rehabilitation depends

on the time constraints of the care-giver rather than the patients [17]. Thus, again it leads to sustained and thus, increased Kinesiophobia levels after discharge as patients do not attend cardiac rehabilitation. This is seen mostly in elder population.

In our study, the maximum distance walked in six minutes was calculated. Predicted values using reference equation given by Ramanathan et al were used [13]. Functional Capacity was found by calculating the percent predicted value of 6MWT. The test was tolerated by all participants and no cardiopulmonary complications were reported. The mean distance walked during the six minutes was 315.8 ± 77.089 meters. The predicted distance was 508.476 ± 21.814 meters. The Functional Capacity (percent predicted) was 62.101 ± 15.075 %. These values are lower than Dolecińska D et al (2020) study [12], having mean distance walked 420 ± 80 meters and percent predicted 70 ± 14 %. Whereas a study done by Yue-Chi Chen in 2018 ⁽²⁵⁾ shows mean distance walked 277.3 ± 85.7 meters and percent predicted of 36.6 ± 10.5 % at discharge which increased to 378.1 ± 95.2 meters and percent predicted of 50.0 ± 11.7 % at Phase II follow-up. The possible reasons for this variation could be difference in race, culture, ethnicity, physical activity and reference equation.

Kinesiophobia and Functional Capacity: The study shows that the two factors Kinesiophobia and Functional capacity are not correlated. Kinesiophobia is proven to be present in patients with coronary artery disease and thus they often have doubts about performing physical activity safely due to the disease ⁽⁴³⁾. Thus, it leads to avoidance behaviour and lack of adherence to cardiac rehabilitation. Post CABG, where the patient is relieved of his previous symptoms and the heart is at a better functional as compared to before surgery, the patient performed better in the walking test showing good functional capacity.

The time period that was selected in this study was 4 weeks after CABG. This is the phase where the patient is relieved of his post- surgical pain and the GSV wound is into

a healing phase. A study done by Hetal M et al to assess Functional Capacity during inpatient cardiac rehabilitation reported the mean distance walked to be 258 ± 62.14 meters and percent predicted of 49.69 ± 12.41 % which is lower as compared to our values [16]. Thus, the walking distance could have been increased owing to decrease in the GSV wound site pain.

Chest binder is usually prescribed to the patients after cardiac surgery owing to the healing of the median sternotomy. As per the hospital protocol, the patient is advised to wear the chest binder for a period of 6-8 weeks. In our study, the Six Minute Walk Test was conducted using the standard guidelines and with every participant wearing the chest binder throughout the test. A study by M O Joshi et al reported that there was marked reduction in Kinesiophobia in patients who were using the chest binder [13].

This could probably be the reason for the better functional capacity as during the 6MWT, they felt secure and protected while performing the test.

Awareness of cardiac rehabilitation and participation in exercise programs has shown to have a positive impact on the level of Kinesiophobia.

After the inpatient cardiac rehabilitation phase till the admission to an out-patient rehabilitation, the patients are given a home-exercise program which involves walking. Adherence to this walking program could have led to a better functional capacity when tested with Six Minute Walk test.

Still, despite the study shows no correlation between Kinesiophobia and Functional Capacity, the mean Kinesiophobia of the population is 41.1 ± 4.743 with 88 % reporting High Kinesiophobia as a barrier should not be underestimated during rehabilitation. Patients have to be screened for Kinesiophobia prior to the start of cardiac rehabilitation.

CONCLUSION

Though the results of the study support null hypothesis, the mean Kinesiophobia of the population is 41.1 ± 4.743 with 88 % reporting

High Kinesiophobia. Thus, Kinesiophobia as a barrier should not be underestimated during rehabilitation.

The possible reasons for high Kinesiophobia could be lack of awareness about the safety and level of physical activity, over-protective care givers, lack of attendance to cardiac rehabilitation post discharge, anxiety and depression.

TSK-SV Heart is a self-report measure, thus subjective bias may be possible. The patient's participation in cardiac rehabilitation program after the Coronary Artery Bypass Graft surgery could have been documented. The study was done only on Phase II CABG patients, thus longitudinal study could have been done to see the long-term effects of Kinesiophobia.

ABBREVIATIONS

CVD- cardiovascular disease

CABG- Coronary Artery Bypass Graft

6MWT- Six Minute Walk Test

6MWD- Six Minute Walk Distance

TSK-SV- Tampa Scale of Kinesiophobia- Short Version

CR- Cardiac Rehabilitation

CVTS- Cardiovascular and Thoracic Surgery

OPD- Out- Patient Department

MUHS- Maharashtra University of Health Sciences

AUTHOR CONTRIBUTION

All authors contributed to the study. Study conception and design was prepared by **TR and HMM**. The first draft of the manuscript was written by **TR**. Formal analysis, manuscript review and editing were done by **HMM**. Final editing was done by **TR and HMM**.

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Conflicts of interest: None

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