

EFFECT OF CHEST BINDER ON KINESIOPHOBIA IN CORONARY ARTERY BYPASS GRAFTING PATIENTS, OVER A PERIOD OF ONE MONTH: A PROSPECTIVE EXPERIMENTAL STUDY

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ABSTRACT

Background: Kinesiophobia has been reported as one of the most common factors that hinder the exercise based cardiac rehabilitation. According to the evidences in the literature and clinical observations, chest binder is prescribed post median sternotomy to reduce the postoperative complaints and complications. Till date no sufficient evidence has been reported regarding effectiveness of chest binder on kinesiophobia in CABG patients post median sternotomy. **Purpose:** To assess the effect of chest binder on the level of kinesiophobia; in CABG patients over a period of one month.

Methods: Participants: Total 70 (50 – males; 20 – females) post CABG via median sternotomy, hemodynamically stable patients, aged between 40 – 70 years, with Tampa Scale for kinesiophobia – short version (TSK – SV) Heart scores > 37 were included. On the 4th post operative day, patients were assessed for level of kinesiophobia using TSK – SV Heart. The patients were divided in to two groups depending on the prescription of chest binder by their surgeons as Group A (with binder), Group B (without binder). One month post CABG, the patients in both the groups were asked to fill the TSK – SV Heart, via telephonic conversation. **Analysis:** Comparison of TSK – SV Heart score at baseline and after one month within Group A and Group B was done using Wilcoxon signed rank test with continuity correction. Comparison of difference of TSK – SV Heart score at baseline and after one month between Group A and Group B was done using Mann – Whitney test. The p value < 0.05 was considered to be statistically significant.

Results: The mean of TSK –SV Heart score on 4th day post CABG in group A and group B was 43.42 (\pm 7.717) and 43.45 (\pm 4.64) respectively. The mean of TSK –SV Heart score on one month post CABG in group A and group B was 35.82 (\pm 8.372) and 39.51 (\pm 6.03) respectively. A significant reduction in kinesiophobia was observed in group A and group B, p-value 0.00001188 and 0.00007886 respectively. The 95% Confidence Interval (CI) median estimate of group A and group B was 7.9 (5.0 – 10.5) and 4.5 (3.0 – 6.0) respectively. The mean of difference of TSK –SV Heart score in group A and group B was 7.6 (\pm 8.24) and 3.94 (\pm 4.82) respectively. The reduction in kinesiophobia in group A was significantly more than in group B, p-value = 0.00792. The 95% Confidence Interval (CI) median estimate of the mean of difference of TSK – SV Heart score in group A and group B was 3.7 (2.48 - 4.92).

Conclusion: There was significant reduction in kinesiophobia irrespective of the use of chest binder post CABG via median sternotomy over a period of one month. There was marked reduction in kinesiophobia in patients who were using chest binder. **Implications:** Use of chest binder is recommended in patients who have kinesiophobia to encourage their participation in exercise based cardiac rehabilitation.

KEY WORDS: Kinesiophobia, CABG, Chest binder.

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INTRODUCTION

In the field of physiotherapy and rehabilitation medicine, it is frequently seen that the fear of movement is the most important factor that limits motor activity. Individual's personality determines the fear of movement. This fear of movement is regarded as kinesiophobia. Kinesiophobia is natively defined as "an excessive, irrational, and debilitating fear of movement and activity, resulting from a feeling of vulnerability to painful injury or re-injury" by Kori et. al. (1990) [1]. Another group of researchers Vlaeyen et. al. further elaborated and redefined the term as "fear of movement/ (re)injury, a specific fear of movement and physical activity that is (wrongfully) assumed to cause re-injury" in 1995 [1]. Kinesiophobia gets influenced by various factors such as gender, age, pain intensity, anxiety, depression and poor self assessment of health [2,3]. Kinesiophobia negatively influences physical activity of an individual, leads to avoidance behaviour, hinders rehabilitation, prolongs disability and pain, and also causes delay in returning to participate in the pre-injury activities [4–7]. Kinesiophobia ultimately compromises feeling of safety. Kinesiophobia affects quality of life of the individual. The individual starts limiting his/her daily physical activities leading to functional disability, withdrawal from occupational, social, leisure activities and may land up in to depression syndrome [8].

It has been proven that kinesiophobia negatively influences individuals attendance in exercised based rehabilitation programs in almost all medical conditions (chronic low back pain, ankylosing spondylitis, hypertension) and surgical conditions (ACL reconstruction, Knee joint replacement, cardiac surgeries). Hence, evaluation of kinesiophobia in individuals before starting any rehabilitation program must be considered a priority by the physiotherapists. In a study performed on patients with chronic low back pain, the authors found that patients with low levels of kinesiophobia were better performers during muscle endurance test and maximal voluntary contraction than patients with high levels of kinesiophobia [9].

Kinesiophobia is 20% prevalent in patients after Coronary Artery Bypass Grafting (CABG), may be as a natural psychological response [9]. The anticipation of increase in pain and sufferings, during or after certain activities, may lead to avoidance in performing such activities [2]. A study result suggested that, specifically feared high intensity activities were avoided by patients with coronary artery disease also when these feared activities were replaced by less feared alternatives, they did not affect the general level of physical activity [9]. Thus, Kinesiophobia negatively influences cardiac rehabilitation post CABG [10].

The choice of surgical approach for CABG surgeries is median sternotomy. Median sternotomy has the best clinical outcome for patients with multiple-vessel disease and co-morbidities [11,12]. The sternal incision causes myofascial pain postoperatively [13,14]. Along with pain, there are potential complications of the surgery such as wound dehiscence, wound infection, sternal instability/non-union and mediastinitis, sometimes leading to sternectomy or death [15]. Post operatively, this "fractured" sternum has to withstand the biomechanical forces acting on it during various activities; like frequent coughing, sneezing, excessive upper limb movements, weight lifting; constant stretch forces acting on thorax and rib cage in obese patients, skin stretch due to heavy breast tissue; abdominal muscle recruitment during change of position from supine to sitting [16].

In view of this fact, sternal precautions are advised immediately post surgery, to reduce the risk of sternal separation (sternal wound dehiscence) and surgical site pain during the movements. The sternal precautions are advised world-wide for different time period post operatively (4 weeks to 3 months) [15,17,18]. These sternal precautions include self – hugging [19], hugging the heart pillow kept over the sternal wound [19], use of external thoracic support (splinting) [16,20] while coughing and other activities like sneezing, deep breathing and bedside mobility, in early post operative days. These maneuvers reduce pain at surgical site during above mentioned activities, help in improving cough effort and maintaining optimal bronchial

hygiene.

The use of supportive device is proven to be better than no support for sternal separation and post operative pain perception [13]. The adjustable fastening brace, sternum support vest and compression garment were found to be effective as compared to other supportive devices. The chest binder provides adequate pressure and stabilization to the sternum. It holds the two halves of sternum and provides antero-posterior stabilization. The cushion provided anteriorly acts as a shock absorber during coughing and deep breathing as well as supports the sternum while turning in the bed. It significantly reduces post operative pain, minimizes the risk of sternal separation by issuing additional sternal stability, promises early and safe rehabilitation and better mobility [13]. Another study also suggests that the chest binder minimizes the friction between the edges of the sternum and thus reduces the pain [21].

The available evidences emphasize on the use of external thoracic support in patients having Body Mass Index (BMI) ≥ 35 , female patients having breast cup size $\geq D$, patients having frequent coughing and diabetic patients who are at the risk of developing sternal wound complications [16]. Similar practice has been observed in clinical practice as well. No much evidence has been reported in the literature to support the practice of not using the chest binder.

Thus, the effectiveness of chest binder on pain, sternal wound dehiscence, early healing has been proven. However, the effect of chest binder on kinesiophobia has not been studied previously. Hence, the purpose of the present study was to assess the effect of chest binder on the level of kinesiophobia in CABG patients, over a period of one month.

MATERIALS AND METHODOLOGY

Study design: The present study was a prospective experimental study conducted in tertiary care hospital for the duration of one year. Convenient sampling with sample size of 70 patients was calculated with type 1 error (α) = 0.05, type 2 error (β) = 10% and power of test = 90% based on prevalence of

Kinesiophobia among Coronary Artery Disease patients of 20%. Hemodynamically stable 50 males and 20 females, aged between 40 – 70 years, operated for CABG via median sternotomy, with Tampa Scale for kinesiophobia – short version (TSK – SV) Heart scores > 37 were included. The patients having Left ventricular ejection fraction (LVEF) $< 35\%$, previous history of CABG and VAS score > 75 mm [10] were excluded from the study.

Outcome Measure: Tampa Scale for Kinesiophobia – Short Version Heart (TSK – SV Heart)

Tampa Scale for Kinesiophobia – Short Version Heart (TSK – SV Heart) [1] : Miller, Kori and Todd developed TSK in 1991, to diagnose kinesiophobia in patients with lower back pain, later on it was used for other conditions, including cardiac conditions. The TSK has been found to be an appropriate tool to identify patients with a high level of kinesiophobia. The scale has 17 items regarding injury or re-injury and fear - avoidance behaviour during activities. Scoring and interpretation : Each item has 4 scores ranging from 1- strongly disagree to 4- strongly agree. While calculating the total score, the score for items 4, 8, 12 and 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. The present study utilized heart specific version of TSK, for patients suffering from coronary artery disease (CAD). TSK – SV Heart has also been used as a tool to effectively measure kinesiophobia in patients after cardiac surgery [22] Psychometric properties : Reliability – 0.77, Construct validity – 0.92.

Methodology: Ethical Committee approval was obtained from the institute and various tertiary care hospital authority and cardiac surgeons prior commencing the study. More than 150 patients were screened and 87 patients were sampled, according to the inclusion criteria, between 2018 to 2019, from the cardiac recovery room of tertiary care hospitals. 16 patients could not be followed up after one month as they did not respond to telephonic call and 1 patient expired unfortunately after discharge. Hence 70 patients were assessed in the study. Out of 70 patients, 50 were males and 20 were females.

On the 4th post operative day, the study procedure was explained to the patients. The demographic data and the informed, written consent of the patient was obtained from the patients and they were assured that the data will be kept confidential except as required by the law. The patients were assessed for the level of kinesiophobia using TSK – SV Heart on the same day. Then the patients were divided in to two groups according to the prescription of chest binder by their treating surgeons as follows-

Group A (Experimental group): Included patients who received the chest binder post CABG and were instructed by their treating surgeon, to use the chest binder through-out the day and night except while bathing. Total 35 patients were included in this group. The chest binder prescribed by the treating surgeon had shoulder straps attached to the chest strap with a cushion provided anteriorly.

Group B (Control group): Included patients who did not receive chest binder post CABG, as decided by their treating surgeon. Total 35 patients were included in this group.

Uniformity was maintained in instructions for sternal precautions and Phase I cardiac rehabilitation in both the groups. Weekly follow up of patients in group A was done to confirm the use of chest binder as per the instructions.

One month post CABG, the patients in both the groups were asked to answer the TSK – SV Heart, via telephonic conversation, by referring the TSK – SV Heart; provided at the time of discharge.

A comparison of the TSK – SV Heart score on 4th day post CABG and one month post CABG was done within the group A and group B. A comparison of change in TSK – SV Heart score from 4th day post CABG to one month post CABG was done between the group A and group B.

Data Analysis: The statistical analysis was done using R software. Mean, standard deviation and percentage were used for analysis of descriptive data of patients. Wilcoxon signed rank test with continuity correction was used for comparison of TSK – SV Heart score on 4th day post CABG and one month post CABG within Group A and Group B. Mann – Whitney test was used for Comparison of difference of TSK – SV Heart score on 4th day post CABG and one month post CABG

between Group A and Group B.

RESULTS

Table 1:

Values	Group A	Group B
Pre mean (SD)	43.42 ± 7.717	43.45 (± 4.64)
Post mean (SD)	35.82 ± 8.372	39.51 (± 6.03)
Mean of differences (SD)	7.6 (± 8.24)	3.94 (± 4.82)

Table 2:

Comparisons	95% Confidence Interval (CI)	Two tailed p – value	One tailed p – value
Mean TSK – SV Heart score within Group A	7.9 (5.0 – 10.5)	0.000023	0.000011
Mean TSK – SV Heart score within Group B	4.5 (3.0 – 6.0)	0.000015	0.0078
Mean of difference of TSK – SV Heart score between Group A and Group B	3.7 (2.48 - 4.92)	0.01000	0.0079

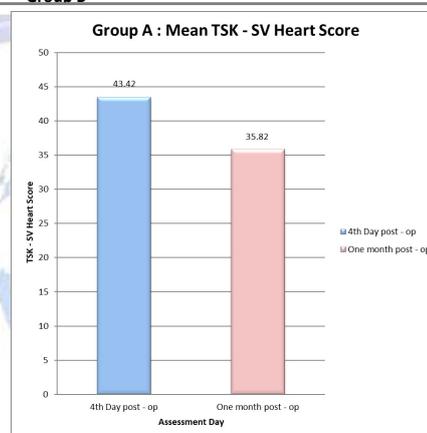


Fig. 1: The comparison of Mean TSK – SV Heart score within Group A.

The difference was found to be statistically extremely significant with the two tailed p - value = 0.000023. Thus, a significant alteration in kinesiophobia was observed in patients using chest binder.

It was also found that, there was statistically significant reduction in kinesiophobia score, with the one tailed p - value = 0.000011. Thus, a significant reduction in kinesiophobia was observed in patients using chest binder.

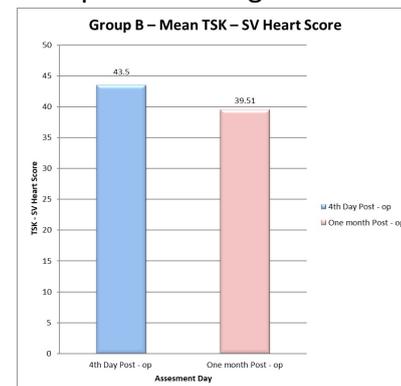


Fig. 2: The comparison of means of TSK – SV Heart scores within Group B.

The difference was found to be statistically extremely significant with the two tailed p - value = 0.00015. Thus, a significant alteration in kinesiophobia was observed in patients without using chest binder.

It was also found that, there was statistically significant reduction in kinesiophobia score, with the one tailed p - value = 0.0078. Thus, a significant reduction in kinesiophobia was observed in patients without using chest binder.

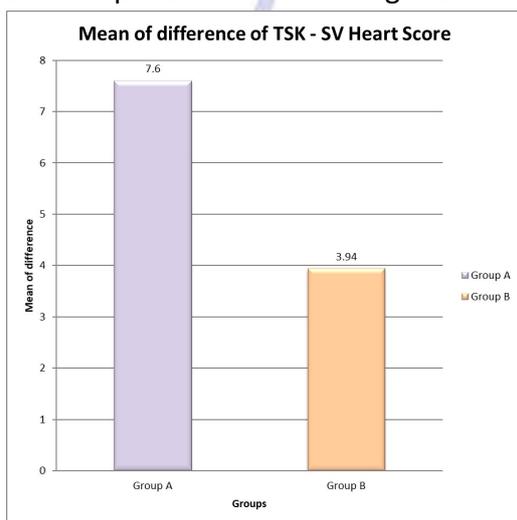


Fig. 3: The comparison of mean of difference of TSK – SV Heart score between Group A and Group B.

The difference was found to be statistically significant with the two tailed p - value = 0.01. Thus, a significant alteration in kinesiophobia was observed in patients with and without using chest binder.

It was also found that, there was statistically significant reduction in kinesiophobia score, with the one tailed p - value = 0.0079. Thus, the difference in kinesiophobia in patients with binder is significantly more than those without binder.

DISCUSSION

The present study is the first known study in the literature investigating the effect of chest binder on kinesiophobia in patients post CABG. In this respect, the present study carries an originality. The TSK – SV Heart used in the present study is an effective tool to assess the level of kinesiophobia in patients after cardiac surgery [22]. The TSK – SV Heart score on 4th day post CABG and after one-month post CABG were considered for statistical analysis.

The result of comparison of mean TSK – SV Heart

score on 4th day post CABG and after one month post CABG within group A and Group B showed that the kinesiophobia reduced significantly in patients irrespective of use of chest binder, over a period of one month. This finding is consistent with other study by Nair et. al.[22] in which they observed that, kinesiophobia reduced from pre- operative period till the time of discharge. They thought that pre-operative higher levels of kinesiophobia would be present as the patients believe that they should detach themselves from physical fitness, exercises and excitement due to presence of coronary artery disease and the reduction in the kinesiophobia by the time of discharge would have occurred as the patient starts feeling of contentment and confidence during in – patient cardiac rehabilitation.

In the present study it was observed that, though the kinesiophobia reduced irrespective of the use of chest binder over a period of one month, the reduction in kinesiophobia was more pronounced and statistically significant in patients who used chest binder as directed by their treating surgeons throughout the duration of the present study. With the use of chest binder there might not be any catastrophizing which would have lead to confrontation and recovery. The patient might feel safe and protected while performing various activities of day to day life. This feeling of safety might have helped the patient in performing activities independently leading to reduction in kinesiophobia post operatively over a period of time. Also due to the external support provided by the chest binder there is reduction in post operative pain while performing various activities like coughing, sneezing, upper limb movements and moving around. This reduction in pain might have lead to reduction in associated kinesiophobia.

A study conducted by Gulcan Harput, et.al.[23], evaluated the effect of external support on knee performance in anterior cruciate ligament reconstructed individuals with higher level of kinesiophobia, after six months of surgery who could not return to pre injury activity level due to their kinesiophobia. In this study the patients were randomly grouped in to three groups who received knee bracing (KB), kinesiotaping (KT) and no intervention and were assessed for

functional performance which included knee strength, One Leg Hop distance Test (OLHT) and Star Excursion Balance Test (SEBT) and self – reported knee function. The authors observed that, prophylactic KB and KT application helped individuals to overcome kinesiophobia. They also observed that, KB was more effective in improving knee strength and self-reported knee function. Thus, they concluded that external support device has a positive effect on reducing kinesiophobia in ACL reconstructed individuals. The authors thought that, the compressive force of the brace might have helped in boosting individual's confidence in own knee and hence the individuals could have exerted higher peak muscle torques. They assumed that the improvements in OLHT could be due to KT and KB which might have improved individual's confidence in own knee while hopping and thus may have reduced their kinesiophobia. Therefore, it can be stated that, similar effects of chest binder could have reduced kinesiophobia in CABG patients as well.

CONCLUSION

The present study concluded that, the chest binder was effective in reducing kinesiophobia, post CABG via median sternotomy, over a period of one month. Thus the use of chest binder is recommended in patients who have kinesiophobia, which may encourage their participation in exercise based cardiac rehabilitation.

ABBREVIATIONS

CABG – Coronary artery bypass grafting

ACL – Anterior cruciate ligament

TSK – SV Heart – Tampa scale for kinesiophobia – short version Heart

KB – Knee bracing

KT – Kinesiotaping

OLHT – One leg hop test

SEBT – Star Excursion Balance Test

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Conflicts of interest: None

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