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Effect of Kinesiophobia on functional outcome in patients with total knee replacement- A comparative study

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ABSTRACT

Total knee replacement has been found as an effective measure to reduce pain and improve function in cases of severe osteoarthritis. Kinesiophobia is an important factor that affects the function in total knee replacement patients. The purpose of the study was to determine if kinesiophobia had an effect on functional outcome by comparing pain, active knee range of motion and function between high and low kinesiophobia groups in TKR patients. In this comparative study, 12 patients who underwent Total knee replacement with postoperative days 3-7 were recruited from hospitals by convenience sampling method. Patients were assessed for kinesiophobia by Tampa scale of kinesiophobia, pain was assessed at rest and on movement using NPRS scale, active knee range of motion was measured using Goniometer and function was assessed using 4-item DGI. After all measurements were taken patients were grouped into high kinesiophobia (n=6) and low kinesiophobia group (n=6) depending upon the score and pain, active knee range of motion and function were compared between these two groups. Unpaired t test was conducted to compare the pain at rest (p=0.0158), pain on movement (p=0.0015), active knee range of motion (p=0.0138) and 4-item DGI (p=0.0138) score between high and low kinesiophobia groups which showed statistically significant difference in these variables. These results suggest that kinesiophobia have an impact on the early functional outcome after total knee replacement surgery. Hence, these patients should be screened for kinesiophobia and rehabilitation should be programmed considering kinesiophobia.

Keywords: Total knee replacement, Tampa scale of kinesiophobia, Range of motion, Functional outcome, 4-item Dynamic gait index.

INTRODUCTION

Total knee replacement is a surgical procedure in which an artificial joint or prosthesis replaces a damaged knee joint. The primary indication for TKR is restriction in the daily activities due to severe pain [1]. Total knee replacement surgery emerged as the most effective treatment for reducing pain and improving function in the end stage osteoarthritis over the last four decades [2].

Psychological factors have a great influence on patient's pain perception, rehabilitation compliance and outcomes following surgery like total knee replacement which requires immense rehabilitation

[3]. According to the fear avoidance cognitive behavioral model there are two pathways for interpretation and management of pain after injury: 1) pain is perceived correctly as non-threatening and the individual returns to the normal activity while in 2) pain is perceived incorrectly as threatening and it leads to kinesiophobia, a pain related fear of movement. And therefore, kinesiophobia can further lead to reduced range of motion at the joint and often cause to continue a cycle of pain and disuse that may cause chronic pain syndrome and reduced physical function [4].

Kinesiophobia has been found to perpetuate illness behavior and disability eventually characterized by poor cognitive and physical performance. In a study done by Filardo et al, Kinesiophobia strongly correlated with acute postoperative pain perception and recovery upto 1 year after surgery showing relevant clinical impact on the functional outcome post-surgery [5]. The Tampa Scale of Kinesiophobia (TSK) is a validated instrument used to measure pain-related fear of movement. Good internal validity and test-retest reliability have been noted when the TSK is administered to orthopaedic patients [4, 6, 7].

The pain intensity assessment in the acute stage, post-surgery needs to be assessed both at rest and while during movement (dynamic pain) as it occurs with mobilization of the patient and helps to associate with functional outcome of the patient [8]. The knee range of motion achieved by the patient within one week following surgery prognosticates the range of motion that will be achieved over one year [9]. In a study conducted by Devers et al., post-operative knee flexion range showed to have influence on patient's fulfillment of expectations, functional ability and knee perception but failed to show any effect on patient satisfaction [10]. Dynamic gait index is a performance based clinical tool used to assess the gait, balance and risk of fall which consists of 8 items. The 4 item dynamic gait index is a short form of DGI developed for persons with balance and vestibular disorders. In previous study done by Marchetti GF et al. the measurement of walking function and the psychometric properties of the 4-item DGI were found to be equivalent or superior as compared to that of 8-item test [11].

The purpose of the study was to determine whether kinesiophobia affects the early functional outcome in patients undergone total knee replacement and compare the between high and low kinesiophobia groups for pain, active knee range of motion and functional outcome.

METHODOLOGY

Study design: Comparative study
Study setting: Nashik city
Duration of study- 6 months
Sample size: 12
Sampling technique: convenient sampling technique

METHOD OF DATA COLLECTION

The study was conducted in various hospitals in Nashik city, Maharashtra. 12 patients who underwent total knee replacement with post- operative dates of 3-7 days were selected from the hospitals. Each patient was clinically assessed by the first author based on the inclusion and exclusion criteria. Each patient was given a written consent form and was be explained the need of the study.
The patient was asked to fill the Tampa scale for kinesiophobia. All patients were assessed by the first author for:

Pain using Numerical pain rating scale

The NPRS is a segmented numeric version of the visual analogue scale in which a respondent selects a whole number (0–10) that best reflects the intensity of his/her pain. A horizontal segmented line is drawn. Similar to the VAS, the NPRS is anchored by terms describing pain severity extremes. Patient was asked to mark their pain intensity at rest and on movement on two NPRS scales.

Active knee ROM

It was measured with the help of universal goniometer with patient in supine, fulcrum at the lateral epicondyle of knee and the stable arm parallel to the lateral aspect of thigh and moving arm lateral aspect of tibia. Patient was asked to actively flex the affected knee as much as possible and the range is measured in angles.

Functional outcome by 4 item dynamic gait index

Patient was asked to: 1) ambulate over a 4.1m walkway, 2) to ambulate at their self-selected speed, fast and slow speeds, plus to walk while 3) turning their head and 4) looking up/down. Each of the 4 tasks is scored on a 0 to 3 ordinal scale, with a

possible range of scores from 0-12. Higher scores indicate more stable ambulation.

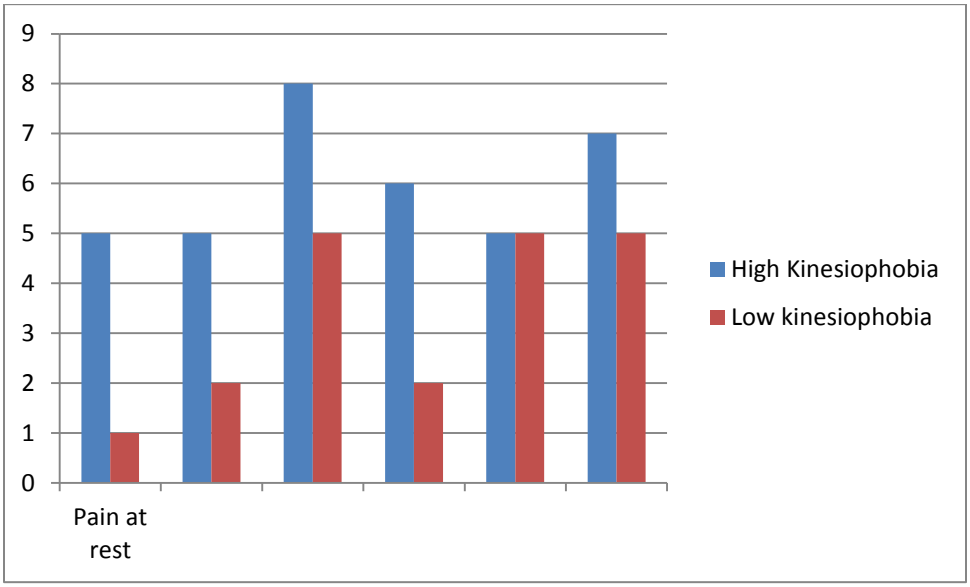
Data Analysis

The collected data was analyzed and patients were allocated to either high or low kinesiophobia group depending upon their score and the data was analyzed statistically using GraphPad Instat. Comparison of both high & low kinesiophobia groups for pain at rest and at movement, active knee range of motion and function was done using Unpaired T test.

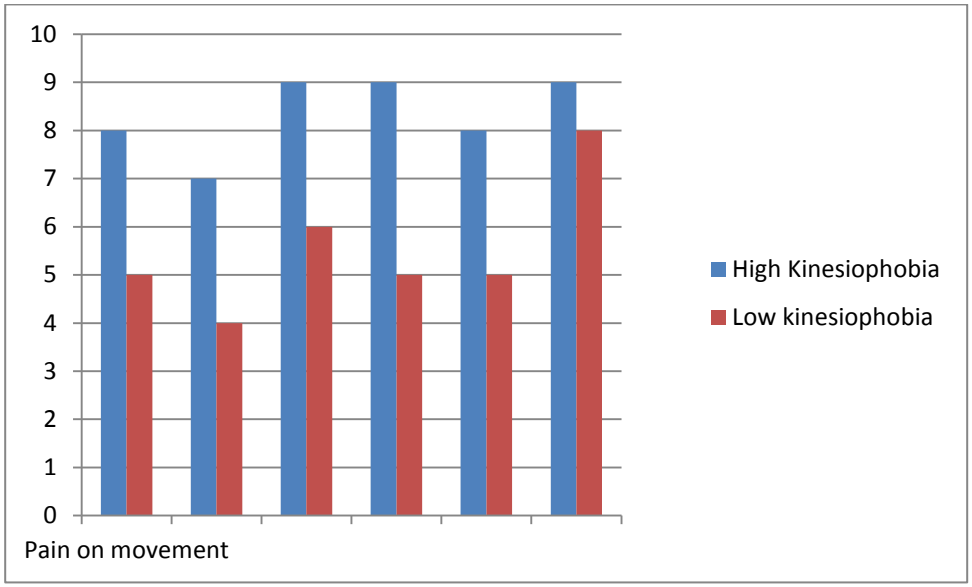
STATISTICAL ANALYSIS

Table: Comparison of pain, active knee ROM and 4-item DGI score in high and low kinesiophobia groups

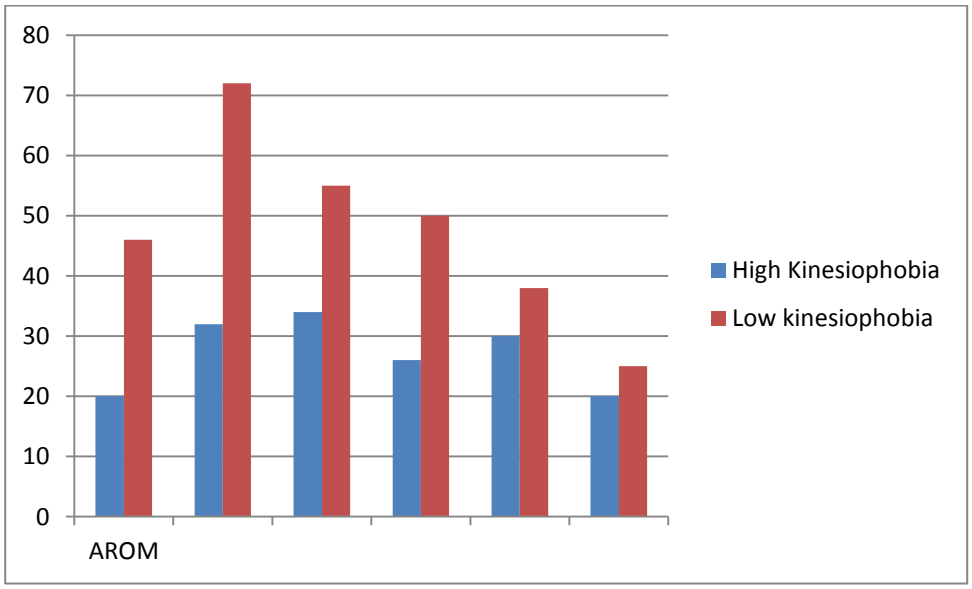
Parameters	Mean of high kinesiophobia	Mean of low kinesiophobia	Unpaired T test value	'P' Value	Significance
Pain at rest	6	3.33	2.9019	0.0158	Significant
Pain on movement	8.33	5.5	4.3320	0.0015	Significant
Active knee ROM	27	47.66	2.9795	0.0138	Significant
4-item DGI score	4.5	7.33	4.7150	0.0008	Extremely Significant



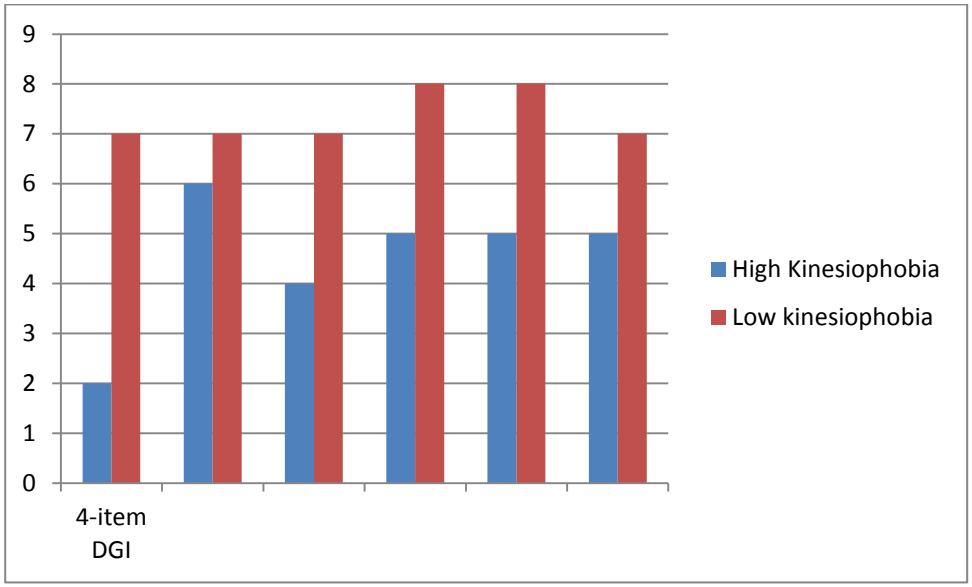
Graph 1: Effect of high and low kinesiophobia on pain at rest



Graph 2: Effect of high and low kinesiophobia on pain on movement



Graph 3: Effect of high and low kinesiophobia on active knee ROM



Graph 4: Effect of high and low kinesiophobia on 4-item DGI score

DISCUSSION

Total knee replacement (TKR) is an effective surgical procedure to reduce pain and disability in patients with degenerative joint disease of the knee joint. In recent years TKR has developed as a highly successful operative procedure in the management of patients with disabling knee pain and reduced quality of life and function emerging from severe osteoarthritis [12]. Though there have been advancements in the surgical procedure, anesthetic techniques and refined prosthesis designs, a significant proportion of patients are dissatisfied with TKR [13, 14]. This dissatisfaction may be due to various risk factors like catastrophising pain, fear of movement, depression, social support, coping skills and anxiety [15]. Kinesiophobia is found to be a significant risk factor affecting the functional outcome in patients with TKR [16].

In the present study, on comparison of both the groups the results showed that the pain, knee ROM and functional outcome were affected by kinesiophobia after total knee replacement. The low kinesiophobia group showed better functional outcome as compared to the high kinesiophobia group. High levels of kinesiophobia have been found in patients who have undergone total knee replacement and it is emphasized that kinesiophobia predisposes the patients to develop chronic pain conditions, affecting their functional outcomes [16]. The present study shows that the patients with high kinesiophobia had more pain at rest (p=0.0158) and on movement (p=0.0015) after surgery as compared to the low kinesiophobia group. Patients with more pain intensity were more prone to develop kinesiophobia [17]. This supports the findings in the present study suggesting higher pain intensity as a significant risk factor predisposing patients to high kinesiophobia post TKR. In a study done by Libai Cai et al. they found that the incidence of kinesiophobia after to be 24.4% and found greater pain intensity along with other factors to be the contributing factor for kinesiophobia [18]. In previous study done, they found that more severe acute postoperative pain to be associated with more severe residual pain after TKR at six to twelve months after surgery [15, 19].

Range of motion (ROM) is the most important outcome that defines the functional ability after total knee replacement. The present study shows that the active knee ROM was significantly lower in the high kinesiophobia group as compared to the low kinesiophobia group in patients undergone TKR (p=0.0138). In a previous study done by Matthew Brown, et al they found that the correlation between ROM and Tampa scale was significant in patients following total knee replacement. Thus indicating Tampa scale to be a good indicator of reduced ROM in TKR patients and that one point increase in Tampa scale of kinesiophobia is associated with a loss of approximately one-half to two-thirds of a degree of knee flexion following TKR [4]. In a similar study, they found that kinesiophobia was associated with pain, ROM and function in patients with TKR. They

found that the ROM was reduced in patient's post-TKR. This data supports the findings in the present study result that ROM is significantly reduced in patients with high kinesiophobia than the ones with lower Tampa scale for kinesiophobia score. This might be due to the fear of movement in patients which they had in mind due to preoperative pain due to chronic osteoarthritis [20]. A positive correlation between preoperative and postoperative ROM is well established [21], indicating that patients with higher pre-operative ROM have higher ROM postoperatively [22].

It has been found that patients with higher pain intensity may excessively focus on potential dangerous pain signals from the environment which may lead them to a narrow attention scope. Hence, these individuals tend to reduce the risk of pain of exacerbation by avoiding movement in general [23]. Somers et al. found that individuals who experience pain-related fear are likely to engage in avoidance behavior's, especially avoidance of movement and thus, less physical activity [24]. Tampa scale for kinesiophobia aims to quantify patients' pain related abnormal, exaggerated beliefs and maladapted response to pain that reduces patient's willingness to move. In the present study we found that the 4- item Dynamic gait index score was significantly less in patients with high kinesiophobia indicating poorer function as compared to those with low kinesiophobia which showed better function (p=0.0138).Though 4-item DGI scale has been considered to be a validated measure with its clinical psychometric properties equivalent or superior to those of the 8-item test to assess gait in people with balance disorders [11]. Due to to reduced muscle strength and proprioception following TKR these patients experienced greater postural sway mostly anteroposterior and lateral sway compared to controls due to which they are prone to functional limitations in daily activities and walking capacity and increases risk of falls. This further may lead to fear and avoidance of movement. There was no previous study done that used 4-item Dynamic Gait Index to assess functional outcome post TKR [25]. In a study done by Riddle et al. they found patients pain related beliefs were associated with pain and functional outcome in patients who had undergone TKR. There was a significant association between poor outcome and increased Pain Catastrophizing Scale (PCS) and poor outcome associated with increased score on Tampa scale of kinesiophobia [26]. Also, in another study done by Doury-Panchoutt et al. they used the 2 minute walk test which they used as a measure for function and found that the patients with high levels of kinesiophobia walked for shorter distance and the fear avoidance model was considered to be the cause of reduced functional outcome [27]. This suggests that high kinesiophobia to be a contributing factor for reduced functional outcome post total knee replacement thus supporting the findings in the present study showing extremely significant difference between both groups.

It is uncertain that how much of reduced knee flexion is clinically significant but higher tampa scale of kinesophobia score may help identify patients who are at a risk for reduced range of motion and function following TKR. These patients can be targeted and counselled preoperatively about postoperative pain and reduced ROM.

CONCLUSION

In conclusion, kinesiophobia is a factor that affects the functional outcomes after total knee replacement. The clinicians need to consider the effect of kinesiophobia on pain, ROM and function while designing a therapeutic exercise programme.

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