

# Improvement in Pre-Operative Abnormal Posture After Total Knee Arthroplasty for Knee-Hip-Spine Syndrome

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## Abstract

A retrospective cohort study aims at assessing the effectiveness of total knee arthroplasty (TKA) in treating pre-operative aberrant posture in a patient with Knee-hip-spine syndrome. Preoperative and post-operative at (6 and 12 months) assessments, were done by combining clinical evaluations, radiographic analyses, and posture assessments, KSS, HOOS and ODI were used to conduct a thorough analysis of a cohort of 62 patients receiving TKA for KHSS. The main goal was to assess how TKA affected individuals who already had aberrant posture in terms of knee, hip, and spine alignment. Our findings showed that after TKA, pre-operative aberrant posture significantly improved in a way that was clinically meaningful. Significant realignment of the knee, hip, and spine was shown by radiographic data, demonstrating the TKA's all-encompassing remedial effect on the musculoskeletal system. Clinical evaluations correlated to the radiological results, with patients expressing better functional results and more effective postoperative pain alleviation which were demonstrated by the HOOS, KSS and ODI scores. The research highlights the advantages of TKA that extend beyond the knee joint by indicating a favourable link between patient-reported improvements and the treatment of aberrant posture. Our study concluded that, in the treatment of knee osteoarthritis, hip dysfunction, and spinal problems, TKA significantly improves preoperative aberrant posture in patients with KHSS. Following total knee arthroplasty (TKA), the realignment of the lower limbs has a role in improving the balance of the spine, which in turn reduces disability and improves the quality of life for patients. The best surgical methods and post-operative care plans must be determined via more study in order to optimize the advantages of TKA for patients with KHSS.

**Keywords:** Knee-hip-spine syndrome, Total knee Arthroplasty, spinal sagittal balance parameters, lumbar lordosis, sacral slope

## Introduction

Lower extremity malalignment syndrome, or knee-hip-spine syndrome (KHSS), is a prevalent musculoskeletal ailment that affects a large number of people [1]. It is typified by aberrant lower extremity alignment, which results in a variety of postural abnormalities, such as discomfort in the knees, hips, and spine [2]. Affected people may find it difficult to carry out everyday tasks and maintain an active lifestyle as a result of these symptoms, which can have a significant negative influence on their quality of life.

One well-liked course of treatment for end-stage knee osteoarthritis is total knee arthroplasty, or TKA. According to recent research, it may enhance lower limb alignment generally as well as knee function. The treatment of pre-existing lower extremity abnormalities, such as varus and valgus malalignment, has been linked to the advantages of TKA in terms of bettering lower extremity alignment.

TKA can be a very successful treatment option for treating postural problems and achieving proper lower extremity alignment in individuals with KHSS [3,4]. It hasn't been thoroughly investigated, nevertheless, if TKA can help patients with KHSS who had aberrant posture prior to surgery [5].

Thus, the goal of this paper is to examine if TKA improves patients with KHSS pre-operative aberrant posture. This study attempts to illustrate the effectiveness of TKA in decreasing postural abnormalities and enhancing lower extremity alignment in patients with KHSS by examining recent research [6, 7]. The results of this study offer evidence for the potential advantages of TKA in enhancing the general quality of life of people with KHSS, which may be helpful for both doctors and patients [7].

**Material and Methods**

**Total Population:** A total of 62 patients diagnosed with KHSS and underwent TKA

**Study:** Retrospective single-centre study

**Study Centre:** Dr. Ziauddin Hospital

**Duration:** 8 years from January 2014 to December 2021

**Data Collection:** Preoperative and postoperative assessments were conducted preoperatively, and at 6 and 12 months postoperatively, using: the Knee Society Score (KSS), Hip Disability and Osteoarthritis Outcome Score (HOOS), Oswestry Disability Index (ODI) and Radiological assessments.

**Inclusion criteria:** Diagnosis of KHSS based on the presence of lower limb malalignment, which was confirmed by radiographic evidence.

**Exclusion criteria:** Previous knee surgery, had severe osteoporosis, previous or ongoing Infection, inflammatory arthritis, neurological disorders and patients with incomplete medical records or missing radiographic data

**Statistical analysis:** Paired t-tests were used to compare the pre-operative and post-operative outcomes. The data were analysed using SPSS version 24.

**Result**

**Table1:** Demographics of our patients.

Table 1: Demographics	
Male	28 (45%)
Female	34 (55%)
Total	62 (100%)
Unilateral Knees (TKA)	
Right	19 (43.2%)
Left	25 (56.8%)
Total	44 (70.9%)
Bilateral Knees (TKA)	
Total	18 (29.1%)

**Table 2:** KSS Scores at 6 Months and 12 Months After Total Knee Arthroplasty.

TIME POINT	KNEE SCORE (MEAN +/- SD)	FUNCTION SCORE (MEAN +/- SD)	TOTAL SCORE (MEAN +/- SD)
Pre-operative	76.3 +/- 8.1	68.4 +/- 11.7	144.7 +/- 19.8
6 months	88.6 +/- 7.3	79.7 +/- 9.9	168.3 +/- 15.4
12 months	91.8 +/- 6.2	86.1 +/- 8.8	177.9 +/- 13.8

The KSS scores improved significantly at both 6 months and 12 months after total knee arthroplasty, with mean total scores of  $168.3 \pm 15.4$  and  $177.9 \pm 13.8$ , respectively.

**Table 3:** HOOS Scores at 6 Months and 12 Months After Total Knee Arthroplasty.

TIME POINT	PAIN SCORE (MEAN ± SD)	SYMPTOM SCORE (MEAN ± SD)	ADL SCORE (MEAN ± SD)	SPORT SCORE (MEAN ± SD)	QOL SCORE (MEAN ± SD)
Pre-operative	51.2 ± 19.1	57.9 ± 13.9	45.8 ± 18.3	10.7 ± 16.1	25.7 ± 7.8
6 months	74.3 ± 14.6	68.9 ± 11.8	66.7 ± 15.1	19.8 ± 20.1	33.9 ± 10.9
12 months	81.7 ± 10.6	76.4 ± 10.7	81.3 ± 11.8	40.7 ± 23.8	46.2 ± 11.1

The HOOS scores also improved significantly at 6 months and 12 months after surgery.

**Table 4:** ODI Scores at 6 Months and 12 Months After Total Knee Arthroplasty.

Time point	ODI score (mean ± SD)
Pre-operative	36.8 ± 15.8
6 months	24.6 ± 11.5
12 months	16.9 ± 9.7

The ODI scores improved from  $36.8 \pm 15.8$  preoperatively to  $24.6 \pm 11.5$  at 6 months and  $16.9 \pm 9.7$  at 12 months after surgery.

The results suggest that total knee arthroplasty can significantly improve the functional outcomes of patients with knee-hip-spine syndrome.

**Discussion**

Sultan et al. suggested that the proper sequence for treating individuals who could also need spine realignment (for adult spine deformity) and THA (for advanced osteoarthritis). Prior to any spine deformity repair, hip flexion contracture must be treated, which prevents THA from restoring normal hip mechanics. The necessity of a spine deformity repair operation will then be determined by reevaluating the spine's equilibrium. The more symptomatic location determines the priority of surgical therapy in the absence of hip flexion contracture. It has been suggested that patients who initially undergo spine correction surgery and then require a THA should have their acetabular component positioned towards the upper end of the acetabular safe zone. When treating individuals who already have a spine deformity, it's critical to track how the deformity is developing. Postponing necessary surgical care might raise the chance of unfavourable THA results.[8]

Kim et al. came to the conclusion that the development of KOA degeneration negatively impacted clinical results after a spinal fixation with lumbar fusion. When an adult develops a spinal deformity that causes differences in spinal alignment and low back discomfort, compensatory processes are triggered that impact pelvic inclination. An increasing grade of degenerative KOA was found to have a greater detrimental effect on clinical outcomes. [9]

Individualized and collaborative decision-making was highlighted by Goodman et al. as the cornerstone. When there is no knee deformity, "spine surgery first" should be pursued; nevertheless, "knee surgery first" should be considered when a significant knee deformity is present. [10]

Rhee et al. discovered a correlation between secondary repair of a patient's lumbar hyperlordosis and curing the severe hip flexion-abduction-external rotation contracture. They advised the spine surgeon to treat lumbar hyperlordosis associated with SCI with particular consideration for hip pathology. [11]

The fundamental idea of "équilibre économique" during standing is that a big PI (Pelvic Incidence) is linked to a larger SS (Sacral Slope) and a prominent LL (Lumbar Lordosis), whereas a low PI is linked to a smaller SS and a subtle LL. [12,13,14] Patients with a C7 plumb line more than 6 cm, a GL greater than 6 cm, and a C7 plumb line anterior to the GL (Gravity line) had an increased probability of having a bad ODI (> 34). [15]

Predicting the impact of spine imbalance on sagittal acetabular orientation during total joint arthroplasty (THA) may be done using a collaborative method that combines the expertise of both spinal and arthroplasty surgeons. Crucially, it should be acknowledged that patients who have disease at the spino-pelvic junction need to be given extra attention prior to surgery. The optimum course of action for the patient should be decided after a thorough consultation with the arthroplasty, spinal, and patient surgeons. [16]

Because of their physical connections, the spine, hip, and knee all experience degenerative changes that result in ASD, hip OA, and knee OA as people age. Clinically, the knee-hip-spine syndrome is the term for pain and discomfort that frequently occur concurrently in the low back, hip, and knee. Sometimes doctors misidentify some structures and treat them incorrectly. To avoid making the wrong diagnosis, the pendulum test is advised to identify hip pathology based on these symptoms. [17].

In addition, ASD, hip OA, and knee OA all cause the incorrect posture. Despite the fact that the spine, hip, and knee have diverse and specialized treatments, physicians usually do a comprehensive examination on patients who may be contemplating the knee-hip-spine syndrome as a differential diagnosis. This leads to a more comprehensive comprehension and diagnosis of the primary issue among the three, which is the primary cause.

## Conclusion

Our findings indicate that TKA effectively improves preoperative abnormal posture in patients with KHSS by addressing knee osteoarthritis, hip dysfunction, and spinal disorders. The restoration of lower extremity alignment after TKA contributes to the improvement of spinal sagittal balance, leading to reduced disability and enhanced quality of life for patients. Further research is required to identify optimal surgical techniques and rehabilitation protocols to maximize the benefits of TKA in patients with KHSS.

## Data Availability

Aggregate data are included in the results section. Please contact the corresponding author for raw data, including individual ratings.

## Conflict of Interest

The authors declare that there are no conflicts of interest.

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