# Early difference in gait biomechanics between pre and post-Total Knee Arthroplasty in patients with Knee Osteoarthritis

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## Summary

This study examined patients with end-stage knee osteoarthritis awaiting total knee replacement (TKR) and evaluated gait changes before and after surgery. Significant alterations in gait were observed primarily in the hip, particularly on the non-operated side.

## Introduction

Knee osteoarthritis (KOA) is a heterogeneous disease characterized by progressive articular cartilage breakdown, subchondral bone remodeling, ligament and meniscal degeneration, and synovial inflammation, along with damage at the molecular and cellular levels [1]. These structural alterations ultimately lead to joint pain, stiffness, functional disability and a significant reduction in daily movements. This pattern of physical hypoactivity leads to muscle weakening, increased joint stiffness, and deconditioning, which contributes to the worsening of the condition [2]. Meta-analyses have shown a significantly increased risk of both diabetes and cardiovascular disease among OA patients, likely due to decreased mobility [3].

## Methods

This was a cross-sectional observational study, approved by the institution Research Ethics Committee. Twelve patients who were in regular follow-up consults at the clinical hospital. This study evaluated patients with end-stage knee osteoarthritis in a waiting list for total knee replacement (TKR) at a University Hospital. Patients were subjected to gait analysis in our laboratory one day before TKR. After the procedure, they continued follow-up care at our hospital, and between 12 and 16 weeks post-surgery, we conducted a gait re-evaluation. Patients who were unable to walk without support were excluded from our study, as well as those who experienced surgical complications or who missed the 3-month follow-up. Gait analysis was performed using a 12-camera Vero Vicon motion capture system (Vicon, Oxford, United Kingdom) at 100 Hz. Three-dimensional (3D) reconstruction and data analysis were performed using The Motion Monitor xGen system (Innovative Sports Training Inc., Chicago, IL, USA). Seven four-marker sensor clusters were used for collection and a stylus was used to digitize anatomical landmarks for the 3D reconstruction. The participant was then asked to walk at a comfortable pace over the 10 meter fixed walkway for 60 seconds.

## Results and Discussion

Our results indicate that the significant changes observed in the patients' gait occurred primarily at the hip, in movements of extension, flexion, abduction, adduction, and external rotation of the unaffected side (Table 1). In the affected limb, we did not observe significant differences, as this 3-month follow-up is a short period for the patient to have fully adapted and recovered in the operated limb. We will follow up with the patient at 6, 12, and 24 months to see if improvements occur and when they tend to appear. These changes in the non-operated limb may have happened because the patient no longer needs to make any compensations or adaptations to walk without pain.

## Conclusions

We concluded that although the prosthesis replaces the knee joint, the main changes in the short term occur at the hip. A study with a longer follow-up is necessary to understand how these modifications will occur over time

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## References

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[3] Constantino de Campos, G. et al. (2020). Ther. Adv. Musculoskelet. Dis., 12: 1759720X20981219.

**Table 1.** Changes in the range of motion values of the pelvis and hip comparing pre-surgery and 3 months post-surgery.

| | PT | ASB | NASB | AHE | NAHE | AHF | NAHF | AH AB | NA HAB | AH AD | NA HAD | AH ER | NA HER | AH IR | NA HIR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PRE | 17,8º | 7,8º | 5,7º | 10,3º | 14,3º | 36,4º | 28,4º | 13,8º | 11,3º | 8,1º | 7,3º | 17,8º | 18,7º | 10,3º | 13,9º |
| POST | 15º | 6º* | 7,1º | 11,1º | 9,5º* | 33,4º | 33º* | 15,1º | 9,1º* | 7,2º | 9,8º* | 21º | 22,5º* | 10,2º | 11º |

PT: Pelvic Tilt; ASB: Affected Side Bend, NASB: Non Affected Side Bend; AHE: Affected Hip Extension; NAHE: Non Affected Hip Extension; AHF: Affected Hip Flexion; NAHF: Non Affected Hip Flexion;AHAB: Affected Hip Abduction; NAHAB: Non Affected Hip Abduction; AHAD: Affected Hip Adduction; NAHAD: Non Affected Hip Adduction; AHER: Affected Hip External Rotation; NAHER: Non Affected Hip External Rotation; AHIR: Affected Hip Internal Rotation; NAHIR: Non Affected Hip Internal Rotation. * $p<0.05$