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# When Navigating TKA, Tibia 1st Workflow Improves Functional Results Relative to Femur 1st Workflow, at 2Y Follow-up

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**Abstract**

This comparative study evaluates functional outcomes in total knee arthroplasty (TKA) performed with a navigation system using femur-first measured resection (MR) or tibia-first gap balancing (GB) surgical workflows. A single surgeon at one center conducted all procedures using the same implant and navigation system. Data from 123 patients, including demographic information and Oxford Knee Scores (OKS) at preoperative, six weeks, one year, and two-year follow-ups, were analyzed. Results showed no significant differences in early postoperative outcomes between workflows. However, from one year onward, the GB group demonstrated superior functional results, with an OKS improvement of 5.8 points at two years, exceeding the MCID. The GB approach, which integrates joint laxity data into femoral planning, may offer better joint balance and antero-posterior stability over time.

## 1 Introduction

Total knee arthroplasty (TKA) has become a common and effective surgical procedure, providing relief for patients suffering from end-stage knee osteoarthritis. The number of TKA procedures carried out each year continues to grow (1), and it is crucial to determine the success factors of this procedure, particularly as almost 10% of patients report dissatisfaction following TKA (2). The reasons are varied, but the choice of surgical workflow may play a role. Optimal alignment and soft tissue balance in TKA are associated with better outcomes, and these goals can be achieved through different surgical approaches, such as measured resections (MR) or gap balancing (GB). Modern computer assisted system, such as robotics and navigation, have demonstrated improving the restoration of the joint geometry for both approaches (3,4).

The aim of this comparative study was to assess patients' functional results when performing TKA using a navigation system and a femur 1st (MR) or a tibia 1st (GB) surgical workflow.

## 2 Material and Methods

All patients indicated for primary TKA in a single centre were prospectively included when operated following an MR or a GB technique. They were all operated by the same experienced surgeon and using the same implant (Optetrak Logic PS, Exactech) and navigation system (Exactech GPS, Blue-Ortho, France).

De-identified records collected prospectively as part of clinical routine were reviewed retrospectively to gather patients demographic data (patient age, sex, weight, height) and pre-operative Oxford Score (OKS) as well as at 6 weeks, 1 and 2 year follow-up.

The results were presented for continuous variables in terms of mean ± standard deviation. Independent samples Student t-test was used to compare continuous variables between groups when assuming equal variance and corrected t-test (Welch test) when assuming unequal variances. Chi-square tests were performed to compare categorical variables. Values of two side's $p<0.05$ were considered to be significantly different.

## 3 Results

123 patients were included, 87 in the Femur 1st group and 36 in the Tibia 1st group. Table 1 describe the cohort demographic data and the collected Oxford scores at six weeks and one and two years follow-up..

| | **Femur First**<br>Mean±SD | **Tibia First**<br>Mean±SD | **p-value**<br>Chi² (+)<br>Independant Sample T-test (*) |
|---|---|---|---|
| Female Sex | 60.4% | 58.3% | p=0.7827 (+) |
| Age | 69.7±8.7 | 71.3±8.5 | p=0.2160 (*) |
| Weight | 82.3±15.3 | 81.5±15.4 | p=0.7294 (*) |
| Height | 166.2±9.6 | 166.7±9.1 | p=0.7641 (*) |
| PreOP Oxford | 19.5±9.3 | 22.3±8.9 | p=0.0873 (*) |
| | N=87 | N=36 | |
| 6 Weeks Oxford | 29.3±10.4 | 26.9±10.1 | p=0.2433 (*) |
| improvement from PreOP | 8.7±12.7 | 6.9±11.6 | p=0.5210 (*) |
| | N=82 | N=36 | |
| 1 Year Oxford | 34.0±11.2 | 38.5±8.4 | **p=0.0360** (*) |
| improvement from PreOP | 13.5±12.7 | 18.1±11.7 | p=0.0956 (*) |
| | N=39 | N=19 | |
| 2 Years Oxford | 34.7±10.1 | 40.5±8.5 | **p=0.0359** (*) |
| improvement from PreOP | 13.3±13.1 | 19.3±11.1 | p=0.1524 (*) |

Table 1. Influence of Navigated TKA Workflow on Oxford Score, at 6 weeks, 1 and 2 years follow-up..

## Discussion and conclusion

Over the past 10 years, our practice of navigated surgery for total knee arthroplasty has evolved from an "independent cuts" femur first navigated surgery (MR) to a tibia first "ligament balance" procedure (GB). Our hypothesis was that, by providing additional joint laxity data when performing the intraoperative femoral planning, the tibia first procedure would enable more personalized implantation and potentially better immediate and medium-term functional outcomes.

Recently, the literature also seems to be moving in this direction, highlighting the advantages of this procedure to improve the joint balance and reduce the mid-flexion instability, thus the antero-posterior joint stability (5,6).

If this retrospective monocentric study did not highlight statistically significant differences for functional results in the immediate post-surgery period between the groups, the GB group's OKS become superior to the MR group over a longer term, from one year follow-up, and is confirmed at two years, when the result can be considered stabilized. At two years, the OKS difference between groups is even reaching 5.8, which is greater than the minimal clinically important difference for OKS, defined at five (7).

The limitations of this study, despite the homogeneity of the populations (ages, pre-operative Oxford scores), lie in the numerically unbalanced groups and the analysis of a single surgeon's practice, albeit a senior surgeon with experience of navigation. Questions of durability and these differences in long-term outcomes were not investigated here, nor was the impact of implant survival, which will be followed up for this cohort.

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