

Compensation of surgical technique rotational alignment variations in total knee arthroplasty

Submission date 25/10/2025	Recruitment status No longer recruiting	<input type="checkbox"/> Prospectively registered <input checked="" type="checkbox"/> Protocol
Registration date 17/11/2025	Overall study status Completed	<input type="checkbox"/> Statistical analysis plan <input type="checkbox"/> Results
Last Edited 17/11/2025	Condition category Surgery	<input type="checkbox"/> Individual participant data <input checked="" type="checkbox"/> Record updated in last year

Plain English summary of protocol

Background and study aims

Total knee replacement surgery (also called total knee arthroplasty) helps people with severe knee arthritis regain mobility and reduce pain. During surgery, the position and rotation of the artificial joint parts can vary depending on the surgical technique used. These small differences in alignment may affect how the knee feels and functions.

This study compares three surgical techniques for total knee replacement to find out how each affects the rotation of the knee components and whether these differences influence recovery and function two years after surgery.

Who can participate?

Adults with painful knee osteoarthritis who need total knee replacement surgery and have not improved with non-surgical treatments can take part. People with previous fractures or bone surgery around the knee are excluded.

What does the study involve?

Participants are randomly assigned to one of three surgical groups:

- Measured Resection (MR) – the standard technique.
- Gap Balancing with Computer-Assisted Surgery (GB-CAS) – uses a computer to guide bone cuts.
- Gap Balancing with Force-Sensor Soft Tissue Balancing (FS-STB) – uses sensors to measure ligament pressure.

All patients receive the same type of cemented knee implant. CT scans and X-rays are taken before and after surgery to measure the implant positions. Patients are followed for two years and complete knee function and pain questionnaires (Knee Society and WOMAC scores).

What are the possible benefits and risks of participating?

There may be no direct personal benefit, but the findings could help improve surgical accuracy and future patient outcomes. Risks are minimal and limited to extra imaging and assessment time. Surgical risks are the same as for any standard knee replacement.

Where is the study run from?

The study is run from Germans Trias I Pujol University Hospital (Spain), Orthopaedic Surgery Department, in collaboration with the Radiology Department.

When is the study starting and how long is it expected to run for?

Recruitment began in 2015 and finished in 2017. Participants are followed for two years after surgery.

Who is funding the study?

This study has no external funding. It is being carried out as part of institutional clinical research.

Who is the main contact?

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Contact information

Type(s)

Public, Scientific, Principal investigator

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Additional identifiers

Protocol serial number

AC-14-033

Study information

Scientific Title

Different femoral and tibial rotation alignment among measured resection and gap-balanced total knee arthroplasty is compensated by the soft tissue envelope resulting in similar combined knee rotation and clinical outcomes

Acronym

RATKA study

Study objectives

We hypothesized that the measured resection technique, gap-balanced computer-assisted surgery and gap-balanced technique using a force-sensor soft tissue balancing device for achieving both mechanical and rotational alignment in TKA will result in some variation in native knee rotational alignment. We anticipate that the differences in femoral, tibial, and combined TKA rotations will be insufficient to significantly affect the 2-year clinical outcome scores.

Ethics approval required

Ethics approval required

Ethics approval(s)

approved 27/03/2015, Comitè Ètic Hospital Universitari Germans Trias i Pujol (Carretera Canyet s/n, Badalona, Barcelona, 08916, Spain; +34 93 4978880; ceic.germanstrias@gencat.cat), ref: AC-14-033

Study design

Interventional prospective randomized study

Primary study design

Interventional

Study type(s)

Treatment

Health condition(s) or problem(s) studied

Total Knee Arthroplasty surgical techniques in primary osteoarthritis patients

Interventions

Sixty patients were randomly assigned to one of three groups, with 20 patients in each group. A simple random sampling method was used -sealed envelopes-. All three groups underwent mechanically aligned TKA. The first group (MR group) underwent the measured resection technique, the second group (GB-CAS group) underwent gap balancing with CAS, and the third group (FS-STB group) underwent gap balancing with a force-sensor soft-tissue balance device. Follow up for 6 months.

Intervention Type

Procedure/Surgery

Primary outcome(s)

1. Femoral component rotation is measured using Berger's femoral component rotation angle (BFA) on non-contrast-enhanced helical 2D-CT scans at 1–2 months preoperatively and 6 months postoperatively
2. Tibial component rotation is measured using the Anatomic Tibial Angle (ATA) on non-contrast-enhanced helical 2D-CT scans at 1–2 months preoperatively and 6 months postoperatively
3. Combined femoral and tibial rotation in the native knee is measured using the Transepicondylar Posterior Tibial Angle (TE_PTA) on non-contrast-enhanced helical 2D-CT scans at 1–2 months preoperatively
4. Combined femoral and tibial rotation in the TKA knee is measured using the Transepicondylar Posterior Tibial Component Angle (TE_PTCA) on non-contrast-enhanced helical 2D-CT scans at 6 months postoperatively

5. Axial imaging of the femoral epicondylar axis, proximal tibial plateau, tibial tubercle, and ankle joint is performed using non-contrast-enhanced helical 2D-CT scans at 1–2 months preoperatively and 6 months postoperatively
6. Distances and angles in CT images are measured using the Alma Workstation 4.2.3.0 software at 1–2 months preoperatively and 6 months postoperatively

Key secondary outcome(s)

Clinical assessment using the Knee Society Score (KSS), WOMAC score at 1–2 months preoperatively and 6 months postoperatively

Completion date

31/12/2017

Eligibility

Key inclusion criteria

Patients with painful primary osteoarthritis who were unresponsive to nonoperative treatments and scheduled for TKA.

Participant type(s)

Patient

Healthy volunteers allowed

No

Age group

Mixed

Lower age limit

55 years

Upper age limit

85 years

Sex

All

Total final enrolment

55

Key exclusion criteria

Patients with a history of femoral or tibial fractures or previous tibial or femoral osteotomy were excluded to avoid potential alterations in rotational alignment.

Date of first enrolment

23/04/2015

Date of final enrolment

31/12/2015

Locations

Countries of recruitment

Spain

Study participating centre

Germans Trias i Pujol University Hospital

Carretera Canyet s/n

Badalona. Barcelona

Spain

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Sponsor information

Organisation

Hospital Universitari Germans Trias i Pujol

ROR

<https://ror.org/04wxdxa47>

Funder(s)

Funder type

Hospital/treatment centre

Funder Name

Germans Trias i Pujol University Hospital

Results and Publications

Individual participant data (IPD) sharing plan

The datasets generated during and/or analysed during the current study will be available upon request from Jose A Hernández-Hermoso, jahernandezh.germanstrias@gencat.cat

IPD sharing plan summary

Available on request

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
	in Spanish				

[Protocol file](#)

03/11/2025

No

No