

OPINION

by Assoc. Prof. Dr. Nikolay Petrov Kolarov, PhD
Associate Professor at the Department of Orthopaedics and Traumatology, MU-Varna
Clinic of Orthopaedics and Traumatology, MHAT "St. Anna" AD – Varna

MEMBER OF THE SCIENTIFIC JURY
APPOINTED BY ORDER No. R-109-428/27.07.2026
OF THE RECTOR OF MEDICAL UNIVERSITY
"PROF. DR. PARASKEV STOYANOV" – VARNA

Re: the dissertation for the award of the educational and scientific degree "Doctor" in the field of higher education 7. Health Care and Sports, professional field 7.1. Medicine, scientific specialty "Orthopaedics and Traumatology", prepared by Dr. Veselin Vladislavov Grigorov, full-time PhD student at the Department of Orthopaedics and Traumatology, Faculty of Medicine, Medical University "Prof. Dr. Paraskev Stoyanov" – Varna.

Dissertation topic: "Planning in Total Knee Arthroplasty"

Scientific supervisor: Assoc. Prof. Dr. Svetoslav Lachezarov Dobrilov, PhD

The submitted set of documents in paper and electronic form complies with the requirements of the Act on the Development of the Academic Staff in the Republic of Bulgaria (ADASRB), the Regulations for the Implementation of the ADASRB and the Regulations for the Development of the Academic Staff at the Medical University (MU) – Varna.

Biographical Summary of the Candidate

Dr. Veselin Vladislavov Grigorov was born on 11.08.1993 in Varna, where he completed his secondary education at the First English Language School in 2012. In 2018, he graduated in Medicine with a Master's degree from MU-Varna. He acquired a specialty in Orthopaedics and Traumatology in 2024.

His professional medical career began on 19.11.2018 at the Clinic of Orthopaedics and Traumatology at UMHAT "St. Marina" EAD – Varna, where he continues to work, also as an assistant professor.

Dr. Veselin Grigorov has participated in numerous international and Bulgarian conferences and congresses with the aim of advancing his qualifications in the specialty.

Additional professional qualifications and specialisations:

- Completed course "Revision Arthroplasty"
- AO Recon Course – Principles of Total Hip and Knee Arthroplasty

- AO Recon Course – Complex Total Hip and Knee Arthroplasty
- MEET THE MASTERS Knee and Shoulder Arthroscopy Solutions Conference
- MEET THE MASTERS Knee and Shoulder Arthroscopy Solutions Workshop
- 7-day mobility under the Erasmus+ programme at Vulpius Klinik, Bad Rappenau, Germany, under Prof. Michael Clarius, to gain additional knowledge in unicondylar knee arthroplasty and total knee arthroplasty
- ESSKA – EKA All About Partial Knee Arthroplasty Course
- Hip Expert Product Training – Metha®, CoreHip® & Excia® T Meet Direct Anterior Approach

Relevance of the Problem

Primary total knee arthroplasty is a topic of considerable interest to the many orthopaedic surgeons who perform this procedure. Despite highly trained knee arthroplasty teams, a significant proportion of patients remain dissatisfied with the final functional outcome, owing to impaired postoperative soft tissue balance of the knee joint.

Mechanical alignment in the preparation of the distal femur and proximal tibia, aiming at a neutral mechanical axis of 180°, was long considered the gold standard. Research in this field has shown that a large part of the population has a natural valgus or varus alignment. It is precisely this characteristic that may disturb soft tissue balance and lead to a poor functional outcome. The systematic description of this variability has given rise to two classifications: the functional phenotypes of Hirschmann et al. and the CPAK classification by MacDessi. Observations under both classifications show that the neutral mechanical axis does not represent a universal norm.

The two approaches differ significantly in their resource profile. Three-dimensional computed tomography planning combined with a custom-made implant and patient-specific instrumentation represents a level of preoperative personalisation. The other approach, computer-assisted navigation, achieves the same goal through intraoperative registration of anatomical landmarks and real-time control of the resections, using a standard off-the-shelf implant.

The differences between the two approaches come down to the resources used and the time required to perform the surgical intervention. With the first, the diagnostic work-up, the computed tomography scan and the production cycle for manufacturing the implant extend the timeline and increase the cost of the procedure. The navigation method requires a standard, less expensive implant, but adds intraoperative time.

The choice of therapeutic approach between the two methods is poorly addressed in the literature. This is precisely what makes the present study relevant and of key importance for the final outcome. The main thesis is that the navigated method with an off-the-shelf implant can achieve comparable functional results, at a lower cost and with a shorter logistical pathway

for the patient, compared with three-dimensional computed tomography planning with a custom-made implant.

Structure of the Dissertation

The dissertation of Dr. Veselin Vladislavov Grigorov is presented in 101 standard pages and is illustrated with 23 figures and 12 tables.

Its structure complies with the requirements set out in the Regulations for the Development of the Academic Staff at MU-Varna. The bibliography comprises 212 references, of which 2 are in Cyrillic and 210 in Latin script.

Literature Review

The literature review is presented in 50 pages and includes a detailed description of the anatomy and biomechanics of the knee joint, the degenerative changes in osteoarthritis, a brief history of knee arthroplasty, as well as two-dimensional (2D) and three-dimensional (3D) preoperative planning. The clinical outcomes of computer navigation in primary knee arthroplasty are presented in detail.

Robotic systems (the MAKO system by Stryker and the ROSA Knee system by Zimmer Biomet) are also included as an innovation in arthroplasty. Finally, a comparison is made of outcomes and patient satisfaction between robotics and navigation.

In conclusion, the literature review covers the fundamental aspects of planning in primary knee arthroplasty – from the anatomy and biomechanics of the knee joint, through the pathophysiology of gonarthrosis and the indications for primary arthroplasty, to a detailed review of the methods of preoperative planning and intraoperative navigation.

Aim, Objectives and Hypotheses

The aim of the present study is to carry out a comparative analysis of the accuracy of the achieved axial alignment and of the early clinical and functional outcomes of two contemporary approaches to total knee arthroplasty (customised knee arthroplasty and computer-navigated arthroplasty).

To achieve this aim, the following objectives have been formulated in the dissertation:

1. To compare the achieved postoperative mechanical axis of the lower limb (HKA angle) between the two groups.
2. To assess the accuracy of execution relative to the preoperative plan ("plan versus reality") for both methods.
3. To determine and compare the rate of outliers, defined within restricted kinematic alignment as residual deformity exceeding 5° in the direction of the native axis or a crossover to the opposite axis, allowing for a measurement tolerance of $\pm 1^\circ$.

4. To compare the positioning of the prosthetic components: frontal femoral angle (α), frontal tibial angle (β), tibial slope and femoral rotation.
5. To compare the operative time between the two approaches.
6. To compare the functional and clinical outcomes — Oxford Knee Score (OKS), Visual Analogue Scale for pain (VAS) and range of motion (ROM) — preoperatively and postoperatively, as well as their changes (Δ OKS, Δ VAS, Δ ROM).
7. To record and compare complications and revision rates in the two groups.
8. To compare the benefit–resource ratio (radiation exposure, cost, time) between the two methods in the context of the results achieved.

The working hypothesis is that computer-navigated knee arthroplasty with restricted kinematic alignment achieves comparable functional outcomes and comparable accuracy of axial alignment to the customised approach, with advantages in terms of radiation exposure and cost.

Methodology and Study Design

The study was conducted at the Clinic of Orthopaedics and Traumatology, UMHAT “St. Marina” – Varna. The surgical interventions were performed in the period 2019–2024.

The study included a total of 60 knees, divided into two equal groups of 30 knees each. The unit of analysis is the knee joint undergoing primary total arthroplasty.

Group 1 – Customised total knee arthroplasty (30 knees): three-dimensional CT-based preoperative planning, single-use patient-specific instrumentation and personalised alignment.

Group 2 – Computer-navigated arthroplasty (30 knees): standard implant and intraoperative navigation applying restricted kinematic alignment with up to 5° of varus–valgus deviation from the neutral axis.

The PhD student has selected appropriate statistical methods that provide a complete and reliable assessment of the data, in line with the aim of the study.

Results and Discussion

The results correspond to the objectives set. The PhD student has effectively synthesised and illustrated with tables the distribution of patients by sex in the two groups of 30 knees, the postoperative axial alignment, and the functional and clinical outcomes.

The data from the dissertation research show definitive and statistically significant results with the tests applied (Student’s t-test or the Mann–Whitney test; for qualitative variables – Fisher’s test, etc.).

The functional and clinical outcomes were assessed by three functional parameters (OKS, VAS, ROM). In the between-group comparison, the results are comparable: the postoperative OKS and ROM values overlap. The statistically established difference in OKS between the two groups should not be interpreted as an advantage of either method.

The main finding of the study is that both methods achieve comparable early results and comparable accuracy of axial alignment, with an advantage of the customised approach in terms of operative time and an advantage of the navigated method in terms of radiation exposure and cost. This finding is consistent with the working hypothesis and supports the thesis that comparable results can also be achieved with an off-the-shelf implant at a significantly lower cost.

The conclusions and contributions presented in the dissertation show that this is the first study of its kind to be conducted in Bulgaria. It compares customised primary knee arthroplasty with a custom-made implant combined with computed tomography planning against computer-navigated arthroplasty with kinematic alignment and an off-the-shelf implant.

The conclusion summarises the results of the study. Nine conclusions and nine contributions are formulated, which provide a summary of the results of the study and fully correspond to the aims and objectives set.

Publications Related to the Dissertation

Three full-text publications are related to the topic of the dissertation, with Dr. Veselin Vladislavov Grigorov as first author; two of them are in English.

Dissertation Abstract

The dissertation abstract is structured in accordance with the requirements, and its content corresponds to that of the dissertation.

Conclusion

The dissertation of Dr. Veselin Vladislavov Grigorov, submitted for opinion, is methodologically sound, with a clearly formulated aim and objectives, specific and well-substantiated conclusions, and a relevant contribution to science.

The submitted materials meet all requirements of the Act on the Development of the Academic Staff in the Republic of Bulgaria (ADASRB), the Regulations for the Implementation of the ADASRB and the Regulations of MU-Varna.

Based on the above, I give my positive assessment and propose that the honourable members of the Scientific Jury vote in favour of awarding the educational and scientific degree

“Doctor” in Medicine to Dr. Veselin Vladislavov Grigorov in the scientific specialty
“Orthopaedics and Traumatology”.

09.10.2026

Varna

Opinion prepared by:

Assoc. Prof. Dr. Nikolay Petrov Kolarov, PhD

Заличено на основание чл. 5,
§1, б. „В“ от Регламент (ЕС)
2016/679