

OPINION

by Assoc. Prof. Nedko Ivanov Dimitrov, MD, PhD
Head of the Department of Special Surgery
Faculty of Medicine, Trakia University – Stara Zagora

Regarding: the dissertation thesis of Dr. Veselin Vladislavov Grigorov

Title: “Planning in Total Knee Arthroplasty”

for the acquisition of the educational and scientific degree **“DOCTOR” (PhD)** in the field of higher education 7. “Healthcare and Sports”, professional field 7.1 “Medicine”, scientific specialty “Orthopaedics and Traumatology”, at the Department of Orthopaedics and Traumatology, Faculty of Medicine, Medical University “Prof. Dr. Paraskev Stoyanov” – Varna

Dr. Grigorov was born on 11 August 1993 in Varna. He completed his secondary education at the First Foreign Language School in Varna. In 2018, he graduated with a Master’s degree in Medicine from the Medical University “Prof. Dr. Paraskev Stoyanov” – Varna. Since 19 November 2018, he has been working as a physician-assistant at the Clinic of Orthopaedics and Traumatology, University Hospital “St. Marina” – Varna. He has held no previous appointments. He obtained his specialty in Orthopaedics and Traumatology in May 2024.

During the period since commencing his medical internship, he has completed a number of specialised training programmes and courses, including: Advanced Specialisation in Large Joint Arthroplasty; Advanced Specialisation in Arthroscopy. He has completed a course in Revision Arthroplasty, as well as two AO courses: AO Recon Course – Principles of Total Hip and Knee Arthroplasty and AO Recon Course – Complex Total Hip and Knee Arthroplasty. In addition:

- MEET THE MASTERS Knee and Shoulder Arthroscopy Solutions Conference;
- MEET THE MASTERS Knee and Shoulder Arthroscopy Solutions Workshop;
- 7-day mobility programme under ERASM+, Vilpus Klinik, Bad Rappenau, Germany, under the supervision of Prof. Michael Clarius, aimed at acquiring additional knowledge and skills in unicondylar and total knee arthroplasty;
- ESSKA – EKA All About Partial Knee Arthroplasty Course;
- Hip Expert Product Training – Metha®, CoreHip® & Excia® T Meet Direct Anterior Approach.

He is a member of the Bulgarian Medical Association, BOTA and BAAST. He is also a member of ESSKA.

He was enrolled as a full-time PhD student on 30 January 2020 at the Medical University “Prof. Dr. Paraskev Stoyanov” – Varna, Faculty of Medicine, Department of Orthopaedics and

Traumatology, in the field of higher education 7. Healthcare and Sports, professional field 7.1 Medicine, scientific specialty "Orthopaedics and Traumatology", with the dissertation thesis entitled "Preoperative Planning in Total Knee Arthroplasty", under the supervision of Assoc. Prof. Svetoslav Lazacharov Dobrilov, MD, PhD.

General characteristics of the dissertation

The structure of the dissertation submitted for defence complies with contemporary standards for the preparation of such scientific work. The dissertation comprises 101 standard typewritten pages and is illustrated with 12 tables and 23 figures.

Following the Introduction, the dissertation includes the following sections: Literature Review; Aim and Objectives; Materials and Methods; Results and Discussion; Contributions; Publications; and References. The bibliography comprises 212 references, including 2 sources in Cyrillic and 210 sources in Latin script.

The study was conducted at the Clinic of Orthopaedics and Traumatology of University Hospital "St. Marina" – Varna during the period 2019–2024. The study was approved by the Research Ethics Committee of the Medical University "Prof. Dr. Paraskev Stoyanov" – Varna under Protocol No. 12. The requirements of the European Commission concerning the provision of informed consent by the patients were observed. The dissertation was discussed and approved for defence at a meeting of the Departmental Council of the Department of Orthopaedics and Traumatology at the Medical University "Prof. Dr. Paraskev Stoyanov" – Varna, under Protocol No. 83 dated 27 February 2025.

The submitted dissertation presents a comparative analysis of two contemporary approaches to total knee arthroplasty (TKA): individualized TKA using the individually manufactured Symbios Origin® implant (CIM) and three-dimensional computed tomography-based planning using KNEE-PLAN®, compared with computer-navigated TKA using the BBraun Columbus® system and the OrthoPilot® platform with restricted kinematic alignment.

A total of 60 knees were analysed, with 30 knees allocated to each group and operated on at the Clinic of Orthopaedics and Traumatology at University Hospital "St. Marina" – Varna. The sample size was considered sufficient to provide statistical validity. Postoperative axial alignment, conformity with the preoperative plan, the frequency of outliers according to criteria consistent with restricted kinematic alignment, component positioning, operative time, functional outcomes (OKS, VAS, ROM), complications, and revisions were evaluated.

Preoperative planning in TKA continues to evolve rapidly, driven by technological advances in diagnostic imaging, artificial intelligence, and additive manufacturing. In the context of the present dissertation, preoperative 3D planning represents one of three principal methodologies whose results are compared, alongside conventional 2D planning and intraoperative computer navigation. Understanding the principles, advantages, and

limitations of each of these approaches is fundamental to the interpretation of the clinical data presented in the research component of the dissertation.

It is emphasised that the choice of method for planning and performing TKA is not determined solely by accuracy, but by a comprehensive assessment including the availability of equipment and infrastructure; the training and experience of the surgical team; surgical volume (high-volume centres can more readily amortise investment in navigation/robotics); patient profile (in younger and more active patients, investment in more accurate technology may be more justified); and the healthcare insurance framework.

Considering Bulgarian clinical practice, where access to navigation and robotic systems remains limited, 3D preoperative planning may represent an accessible alternative for improving outcomes in TKA, particularly in complex deformities and in younger patients. The present dissertation is specifically aimed at evaluating these three approaches within the setting of the specific clinical practice at University Hospital "St. Marina" – Varna.

The literature review covers the fundamental aspects of planning in total knee arthroplasty, ranging from the anatomy and biomechanics of the knee joint, through the pathophysiology of gonarthrosis and indications for TKA, to a detailed review of preoperative planning methods and intraoperative navigation.

The principal conclusions from the literature review may be summarised as follows: proper component alignment is of critical importance for the long-term success of TKA. Preoperative planning and intraoperative navigation technologies consistently improve implantation accuracy. Three-dimensional planning is superior to two-dimensional planning with regard to sizing, rotational assessment, and visualisation of bone defects. Computer navigation significantly reduces outliers in axial alignment and may improve long-term implant survival, particularly in younger patients. Robotic surgery is a promising new technology, although long-term data remain limited.

Despite the considerable body of literature on the subject, a number of unanswered questions remain and provide the rationale for the present dissertation: What is the actual clinical value of transitioning from 2D to 3D planning in the context of conventional surgical technique without robotics? Does intraoperative navigation provide a significant advantage over 3D preoperative planning when both methods are applied by experienced surgeons? What is the profile of patients who would benefit most from technology-assisted planning?

The answers to these questions are addressed in the research component of the present dissertation, in which early postoperative functional outcomes are compared between two groups of patients: those undergoing CT-based 3D preoperative planning with the manufacture of individualized implants and those undergoing intraoperative computer navigation, all operated on at the Clinic of Orthopaedics and Traumatology of University Hospital "St. Marina" – Varna.

When selecting a TKA method, not only the accuracy of alignment should be considered, but also the overall resource profile, including radiation exposure, costs, and the patient's logistical pathway. Navigated TKA with restricted kinematic alignment may be regarded as a fully viable alternative in patients for whom avoidance of preoperative computed tomography and the higher cost of the implant is preferred.

The dissertation presented by Dr. Grigorov addresses a contemporary issue in traumatology and reflects the evolution of concepts regarding preoperative planning in total knee arthroplasty over recent decades.

In the literature review, Dr. Grigorov pays particular attention to the development of the concept of alignment in TKA, which has undergone substantial evolution over time, demonstrating excellent and highly comprehensive theoretical and clinical preparation in the field.

The aim of the dissertation is precisely and clearly formulated, and specific and realistically achievable objectives have been defined for its accomplishment. The entire dissertation is structured around its main aim, namely: to perform a comparative analysis of the accuracy of the achieved axial alignment and the early clinical and functional outcomes of two contemporary approaches to total knee arthroplasty (TKA): individualized TKA using the Symbios Origin® implant (customised individually made, CIM) and three-dimensional preoperative planning using the KNEE-PLAN® software, on the one hand, and computer-navigated TKA using the BBraun Columbus® system and the OrthoPilot® navigation platform with restricted kinematic alignment (rKA), on the other.

The "Materials and Methods" section is very professionally structured and excellently illustrated with appropriate tables and graphs. For the processing and analysis of his own results, Dr. Grigorov has employed appropriate statistical methods, providing a reliable basis for the discussion of the data obtained and the conclusions drawn from them. From a methodological standpoint, the dissertation has been conducted to a high European standard.

The results obtained are presented clearly. The data are excellently presented and illustrated with 23 figures and 12 tables.

In the Discussion section, the obtained data are summarised in a clear and concise manner. The discussion is systematically structured, and Dr. Grigorov skilfully and thoroughly utilises his extensive knowledge of the literature on the subject to discuss his own results competently and critically.

As a result of the precisely conducted work and the appropriate discussion of the results, nine conclusions have been formulated. They accurately reflect the scientific research performed.

The dissertation contains contributions that have not only theoretical significance but are also of interest to medical practice.

The bibliography, comprising 212 references cited throughout the various sections, is sufficient in scope. A substantial proportion of the references address fundamental issues.

This testifies to excellent and comprehensive theoretical preparation and represents a strong indication of the broad medical culture and professionalism of the doctoral candidate.

Based on the above, I consider the dissertation thesis of Dr. Veselin Grigorov to be his own work and to fully meet the established requirements and recommended criteria for the award of the educational and scientific degree **"Doctor" (PhD)**.

In conclusion: my assessment of the dissertation thesis submitted by Dr. Grigorov, entitled "Planning in Total Knee Arthroplasty", is entirely positive. With this opinion, I express my firm conviction that the dissertation meets the established requirements for the award of the educational and scientific degree **"Doctor" (PhD)**.

Assoc. Prof. I

Заличено на основание чл. 5,
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