

# **RECENSION**

From

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Appointed as Chairman of the Scientific Jury and official reviewer according to Order № P-109-198 / 29.04.2022 from the Rector of MU-Varna

Based on Art. 45, para. 1 and 2 of the Regulations for development of the academic staff in MU - Varna

About

**Defense of the dissertation of**  
**Dr. Martin Nikolaev Moynov**

On the topic:

**"Neuronavigated needle biopsy in cranial neurosurgery"**

Presented for obtaining the educational and scientific degree "Doctor" in the scientific specialty "Neurosurgery"

Professional field 7.1. Medicine,  
Area of higher education 7. Healthcare and sports.

### **Brief biographical data:**

Dr. Martin Nikolaev Moynov was born in 1985 in the town of Veliko Tarnovo. He graduated from the IV language school in Varna with a profile in French and English in 2004. In 2012 he graduated Medical University - Varna, and then specialized in neurosurgery at the Clinic of Neurosurgery of University hospital "St. George"- Plovdiv and the Neurosurgery clinic of University hospital "St. Marina"- Varna. Since 2017 he has been appointed as an assistant at the Department of Neurosurgery and ENT of Medical University - Varna. Since 2018 he has been a PhD student at the Medical University of Varna on the topic "Neuronavigated needle biopsy in cranial neurosurgery." Since 2019 he works as a specialist in neurosurgery. During his periods as a medical student, resident and neurosurgeon he has conducted long-term and short-term specializations, courses, participated in congresses and symposiums in a number of leading medical and in particular neurosurgical centers in Bulgaria, France, Hungary, Switzerland, Romania, Ghana, Palestine. Dr. Moynov has been a member of the Bulgarian Society of Neurosurgery since 2013, as well as a member of the international society AO Spine since 2017. |He is fluent in French and English.

### **Relevance and significance of the dissertation:**

Modern oncological treatment of patients with malignant neoplasms in region of the brain requires an accurate histological diagnosis. There are risks associated with classical open surgery applied not only in cases of isolated histological verification, but also in cases of combining histological verification and radical excision. The adaptation and application of modern computer technologies in neurosurgery is an expression of the desire of modern medicine to reduce operational risks by achieving minimally invasiveness, controlling operational risk and minimizing postoperative morbidity. The introduction of neuronavigated frameless biopsy is the result of the modernization of the classical frame stereotactic biopsy surgery applied for the purpose of histological verification. There are a limited number of studies in the literature related to evaluating the efficacy and accuracy of this frameless surgical technique.

Neuronavigated (frameless) biopsy is a type of high-tech minimally invasive surgery that allows planning and selection of one or more working trajectories, avoidance of functionally significant areas, localization and tracking of the needle biopsy window in real time, control of the depth and direction during the collection of material for histological examination.

The main advantages of frameless surgery include: real-time visualization of operational objectives, high quality 3D images, no need for a rigid frame allowing a high degree of flexibility of the used surgical equipment in terms of safety, time and cost compared to the classic frame based stereotactic surgery (Price et Dorward 2003, Dhawan et al. 2019). A major disadvantage of neuronavigated surgery is the fact that it is based primarily on preoperative imaging information. This fact, in combination with the invasive nature of surgical interventions, leads to the problem of "brain shift".

It is important to note that there are no established standards for the application of this technique as well as for the imaging studies used, which would allow an objective comparative analysis of the operational results between the different studies.

Neuronavigated biopsy is a minimally invasive surgical method that provides the neurosurgeon with objective and evidence-based intraoperative information about the histological nature of the intraaxial lesion.

The topic of the dissertation "Neuronavigated needle biopsy in cranial neurosurgery" is relevant and considers this minimally invasive frameless stereotaxy as an efficient and safe surgical method providing objective and evidence-based intraoperative information about the histological nature of the lesion, taken into account during the decision on the degree of radicalism while operating.

### **Structure and content of the dissertation:**

The presented dissertation on "Neuronavigated needle biopsy in cranial neurosurgery" has a volume of 173 standard typewritten pages. Its structure fully meets all accepted requirements. It consists of Introduction and Literary Review - 38 pages, Aim and tasks - 1 page, Materials and methods - 26 pages, Results - 57 pages, Discussion - 26 pages, Conclusion and summary - 2 pages, Contributions - 1 page, Bibliography - 15 pages. The presented material is illustrated with 135 figures and 71 tables. Dr. Moynov used 260 literary sources.

The literature review related to the topic is detailed and thorough, using all the cited titles. Detailed acquaintance, both historically and concerning modern trends related to neuronavigation, demonstrates the accumulation of theoretical experience by the author, necessary for his current and future clinical and scientific activities. The introduction and the literature review bring out the unsolved problems and formulate the purpose of the research: Optimization of the minimally invasive neuronavigated technique for diagnosis and treatment, as well as introduction of a surgical algorithm based on analysis and summary of the experience gained using neuronavigated needle biopsy in patients with supratentorial intraaxial lesions. The author aims to achieve this goal by solving seven precisely and clearly formulated tasks.

### **Methodology and organization of the study:**

The study includes a total of 40 operated patients with supratentorial intraaxial lesions in the Neurosurgery Clinic of University Hospital "St. Marina"- Varna for the period January 2019 - December 2021, during which an intraoperative neuronavigated needle biopsy is performed.

### **Results:**

The results are presented in 57 pages and are perfectly illustrated with tables and figures. The patients were divided into two groups: 15 patients with isolated neuronavigated needle biopsy and 25 patients with biopsy and excision of the histologically verified formation. Indications and contraindications for navigating needle biopsy are discussed and the operative time, size of lesions, number of biopsy materials retrospectively analyzed, correlation dependence including used imaging studies and postoperative complications analyzed, and factors influencing age, including diagnostic production, analyzed sequences from intraoperative MRI scans and anamnestic data for previous radiotherapy, previous surgery and previous biopsy.

### **Discussion:**

The results are discussed critically and analytically in the context of current literature sources from the published literature in biopsied patients with intraaxial lesions. The imaging studies used for intraoperative navigation, the technical aspects of

neuronavigated biopsy in relation to the types of biopsy needles, the technique of aspiration, factors influencing diagnostic production, the methodology of obtaining intraoperative biopsy material, intraoperative and postoperative measures are discussed. The individual approach related to the degree of radicalism in the selection of operative equipment is also discussed.

### **Conclusions:**

Based on the results and their discussion, Dr. Moynov formulates conclusions demonstrating that the use of neuronavigated needle biopsy in patients with supratentorial intraaxial lesions has excellent results, high diagnostic yield, increases the surgeon's confidence in deciding on the need for radical surgery, while remaining an efficient, safe intervention with high diagnostic value, with the possibility of application in routine neurosurgical practice.

### **Contributions:**

The author describes a protocol for the application of neuronavigated needle biopsy including 15 clearly defined steps, ensuring repeatability and comparability of operational results and reduces the likelihood of technical error in performing the procedure. The protocol provides high diagnostic output through stereotactic material extraction, to the extent that it compensates for the difficulty of histological processing of samples related to the heterogenic nature of brain tumors, in terms of postoperative complications and mortality, comparable to the frame based biopsy technique widely described in the literature. The author demonstrates that the described surgical protocol ensures the acquisition of the optimal number of biopsy specimens under optimal operative time. An important aspect is the effect of the neuronavigated technique to increase the surgeon's confidence in deciding on the need for radical surgery. A surgical algorithm for the application of neuronavigated needle biopsy and evaluation of the effect of its application in routine clinical practice has been formulated and introduced. The protocol was successfully introduced in the surgical treatment of patients with intraaxial supratentorial lesions in the Clinic of Neurosurgery of the University Hospital "St. Marina" - Varna.

### **Publications:**

Dr Moynov has 4 scientific publications in connection with the dissertation. Of these, two full-text articles and 2 scientific papers were presented at conferences. The author's publications grant enough credit on the account of standard requirements for scientometric indicators for the award of the Educational and Scientific Degree "Doctor" in the surgical specialty Neurosurgery.

### **Conclusion:**

The dissertation developed and presented for defense on the topic "Neuronavigated needle biopsy in cranial neurosurgery" by Dr. Martin Nikolaev Moynov is related to important, current and socially significant pathology in neurosurgery. The clinical material allows obtaining real significant conclusions and contributions. The dissertation is properly structured and meets the existing regulatory requirements. The author has the necessary theoretical knowledge demonstrating qualities and skills needed for independent research.

The dissertation of Dr. Martin Nikolaev Moynov working in the Department of Neurosurgery and ENT Diseases, Faculty of Medicine, Medical University "Prof. Dr.

Paraskev Stoyanov" - Varna is a completed research paper on an issue of great value in neurosurgical practice. The dissertation presents reliable results and is making appropriate conclusions with certain and significant clinical application.

Based on these facts, I definitely believe that the dissertation of Dr. Martin Nikolaev Moynov is completed, significant and meets the requirements of the Law on the Development of Academic Staff in Bulgaria and the Regulations for the implementation of ZRASRB and the relevant Regulations of MU - Varna for obtaining the scientific degree "Doctor" in the scientific specialty "Neurosurgery", for which I vote in favor and propose to the esteemed scientific jury to award the educational and scientific degree "Doctor" to Dr. Martin Nikolaev Moynov.

31.5.2022  
Varna

Assoc. Prof. Dr. Toni Dankov Avramov, Ph.D.

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