

## **POSITION**

By Prof. Dr. Nedelcho Tsachev, MD orthopedist traumatologist  
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With reference to - dissertation of Dr. Dimitar Stefanov Todorov on the topic  
***"Analysis of the results after minimally invasive fixation with angularly stable plates in distal femur fractures AO 33A / 33C"*** for the acquisition of the educational and scientific degree "Doctor" (Ph.D.)

### **CVs and work experience:**

Dr. Todorov was born in 1987. He graduated the Medical University of Plovdiv. In 2013 he started working as a resident doctor in Orthopedics and Traumatology at UMHATEM "N.I.Pirogov", where he continues to work today. In 2018 he acquired a specialty in Orthopedics and Traumatology.

### **Further training and courses:**

In 2014 Dr. Todorov obtained a Certificate of Good Clinical Practice.

He participated in specialized courses of AO: AO Trauma course - Basic Principles of Fracture Management, AO Trauma course - Advanced Principles of Fracture Management.

He is a member of the Bulgarian Medical Association, BOTA, AO Trauma and EORS.

### **Scientific publications:**

1. Todorov D, Zderic I, Richards G, Lenz M, Knobe M, Enchev D, Baltov A, Gueorguiev B, Stoffel K. Is Augmented LISS Plating Biomechanically Advantageous Over Conventional LISS Plating in Unstable Osteoporotic Distal Femoral Fractures? Orthopaedic Research Society. Published by Wiley Periodicals, Inc. J Orthop Res. 2018; 36:2604–2611.

2. Todorov D, Zderic I, Stoffel K, Richards RG, Lenz M, Enchev D, Gueorguiev B. Biomechanical investigation of augmented versus conventional LISS plating of distal femoral fractures. 23rd Congress of the European Society of Biomechanics. July 2 – 5, 2017: Seville, Spain
3. Todorov D, Gueorguiev B, Zderic I, Stoffel K, Richards G, Lenz M, Enchev D, Baltov A. Biomechanical comparison of augmented locking plate fixation versus conventional locking plating. European Orthopaedic Research Society (EORS). September 13-15, 2017: Munich, Germany.
4. Todorov D, Gueorguiev B, Zderic I, Stoffel K, Richards G, Lenz M, Enchev D, Baltov A. Biomechanical comparison of augmented locking plate fixation versus conventional locking plating. Orthopaedic Proceedings (A supplement to The Bone & Joint Journal) Volume 100-B, Issue supp\_4 / April 2018
5. Todorov D, Enchev D. Errors and complications in the treatment of distal femur fractures with minimally invasive osteosynthesis with plates. XXII Conference "BULGARIAN ORTHOPEDICS AND TRAUMATOLOGY DAYS" September 28 - 30, 2017: Tryavna, Bulgaria.
6. Todorov D, Zderic I, Stoffel K, Richards RG, Lenz M, Enchev D, Gueorguiev B. Is Augmented LISS Plating Biomechanically Advantageous In Comparison To Conventional LISS Plating? EFORT Congress; Vienna 31 May - 02 June 2017.
7. Todorov D, Gueorguiev B, Zderic I, Stoffel K, Richards G, Lenz M, Enchev D, Baltov A. Are there biomechanical benefits in augmentation of LISS plating compared to conventional LISS plating? Osteosynthese International 2017 – Annual Meeting of the Gerhard Kuntscher Society September 13-15, 2017: Munich, Germany. ISBN 978-3-9816002-4-7
8. Gueorguiev B, Todorov D, Zderic I, Stoffel K, Lenz M, Richards G, Enchev D. Augmented LISS Plating Is Biomechanically Advantageous Over Conventional LISS Plating Deutscher Kongress für Orthopädie und Unfallchirurgie (DKOU 2017). Berlin, 24.-27.10.2017

The purpose of the work is to “perform a retrospective analysis of the results and complications in patients with distal femur fractures of type AO / OTA A and C, fixed with locking plates, and **to differentiate the risk factors leading to FDF consolidation problems. In addition, to formulate recommendations for**

**optimization of the operative method through biomechanical laboratory tests”.**  
It is clearly formulated and in order to achieve 4 adequate tasks are set out:

1. To critically analyze the methods for treating FDF from the literature.
2. To apply the method of minimally invasive fixation with a locking plate on a sufficient contingent of patients.
3. Based on the analysis of the clinical material and the results of the treatment, to evaluate the opportunities and disadvantages of the chosen tactics.
4. To draw conclusions about the indications and options for augmentation or optimization of the operative method.

The study covers a period of 5 years (January 2013 - December 2017) during which at the Clinics of Orthopedic Traumatology of UMHATEM “N. I. Pirogov”, meeting the criteria, were promptly treated 97 patients with 100 FDF fractures treated by 23 surgeons. 54 patients (57 fractures) were followed up to consolidation and the end of the recovery period. In 79 patients, follow-up was only to assess early and late postoperative mortality.

The cohort consists of 23 (40%) males and 34 (60%) females. The average age in the group is 59.3y. (30-92y).

According to the energy of the trauma, 19 (33%) fractures are caused by high-energy trauma, 38 (66%) - by low-energy one. According to the mechanism of the injury, the distribution is: 2 (3%) – height fall trauma, 15 (26%) - accident, 37 (65%) cases of domestic trauma (fall from own height).

Patients with combined trauma (thoracic, abdominal, traumatic brain injury) were 8 (14%). Accompanying injuries were observed in 18 (31%) patients, with a total of 33 musculoskeletal system injuries.

Gustilo-Anderson classified fractures were 10 (17.5%), of which type I - 4 (7%), type II were 4 (7%), type IIIA were 2 (3.5%).

The diagnosis was made on the basis of clinical examination and X-ray examination (orthogonal radiographs and traction graphs). Diagnostic computed tomography was used in 6 patients.

All operative patients with dislocated FDF are indicated for surgical treatment. The intervention is performed in an emergency or planned order upon stabilization of the general condition of the patient.

The final clinical evaluation was performed using the system of Schatzker (1974). The end result depends on the following criteria: the congruity of the joint, the presence of pain, the volume of movement (measurement with a goniometer) and the residual angular and rotational deformities.

The emphasis in the dissertation is the biomechanical study with a clearly defined purpose: to investigate and compare the biomechanical properties of fixation with a conventional recessed distal femur locking plate with two varieties of augmentation of the same construction.

Modern statistical methods for data analysis, descriptive analysis (variational analysis for quantitative variables: mean, standard deviation, frequency descriptive analysis of qualitative variables), graphical images (histograms and sector diagrams) and inferential statistical analysis (statistical inference method and hypothesis testing) are used in this scientific research.

In conclusion, the author summarizes that the use of a locking plate has two major advantages over osteosynthesis with conventional plate. First of all, the better mechanical fixing provided by the locking mechanism of the screws to the plate is making the structure angularly stable. On the other hand, LCPs are described as internal retainers, which allows their placement through sparing surgical access and preservation of the periosteal blood supply. LCPs have relatively broader indications of use in terms of fracture morphology than IM nails. The development of pro indications and proper application of modern implants and surgical techniques is at the heart of achieving optimal therapeutic results.

The author points out the specific limitations in this scientific work. The retrospective nature of the study and the heterogeneous cohort of covered patients are lower in the evidence hierarchy. Conducting a randomized multicenter trial would have greater scientific weight and should be the subject of future studies.

The use of artificial bone models and the non-destructive model of biomechanical testing deviates the test conditions from normal physiology. However, the experiment satisfies the requirements for differentiating the specific differences

between the various fixation methods. Future studies using cadaveric or in vivo studies will be of greater clinical relevance.

**Conclusion:** The thesis presented by **Dr. Dimitar Todorov** on the topic "Analysis of the results after minimally invasive fixation with angularly stable plates in distal femur fractures AO 33A / 33C" for the acquisition of educational and scientific degree "**Doctor**" addresses a current problem from practice.

Written in a concise scientific language, the work is well structured into 121 pages and illustrated with 13 tables, 32 figures and 9 graphs. The bibliography includes 272 literature sources.

The goal is clearly stated and the tasks set are adequate and optimal for achieving it.

Clinical material is sufficient in volume to allow accurate and reliable scientific judgments based on modern statistical methods. Important practical inputs and conclusions are made.

For this reason, I believe that Dr. Todorov's dissertation fulfills all the requirements for obtaining a doctorate degree and I propose the award of it.

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Sofia

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