R E C E N S I O N

Of the thesis of **Boris Emilov Kyurkchiev, MD**

On the topic: "**PROXIMAL HUMERUS FRACTURES: ANALYSIS OF THE RESULTS AFTER FIXATION WITH ANGLE STABLE LOCKING PLATES**"

For the acquisition of the educational and scientific degree "**Doctor**"

Reviewer: Prof. Nedelcho Tzachev, MD, PhD, MMA – Sofia,

Head of the Department of "Orthopedics, Traumatology and Reconstructive Surgery"

The review complies with the requirements of the Law on the Development of Academic Staff in the Republic of Bulgaria and the Regulations for its implementation, the Rules for the conditions for the acquisition of academic degrees and the occupation of academic positions at the Faculty of Medicine, Medical University-Sofia.

Boris Kyurkchiev was born in 1980. He graduated from the Medical Faculty of the Medical University-Sofia in 2005. In 2007 he started working as a doctor in the Emergency Department of the hospital "Dr. N. Vasiliev", Kyustendil with main activities and responsibilities - Emergency Medicine and Intensive Care. From 2008 to 2013 he is a resident at the IV Orthopedic and Traumatology Clinic of UMHATEM "N. I. Pirogov", Sofia. Specialist in Orthopedics and Traumatology since March 2014. Since 2015 he is an assistant at the IV Orthopedic and Traumatology Clinic of UMHATEM "N. I. Pirogov", Sofia. In 2018 he was appointed as a Head of traumatology unit at the Clinic of Orthopedics, Traumatology and Reconstructive Surgery of the Military Medical Academy - Sofia.

During this period he specialized in several orthopedic clinics. In 2011 he specialized in "Beilinson" University Hospital, Petah Tikva, Israel, with Prof.

Steven Velkes. Specialization in UZ Leuven, Belgium with Prof. Stefaan Nijs - 2012. In the same year, he specialized in University Hospital "Saint Luc", Brussels, Belgium with Prof. Christian Delloye.

Over the years, he has participated in numerous courses and seminars, the most important of which are:

- Certificate of "Anatomy Workshop Shoulder Arthroplasty" course, Canton Hospital of Lucerne, Switzerland, 05/09/2019
- Certificate of "AO Recon Course – Principles of Total Hip and Knee Arthroplasty" , Sofia, Bulgaria, 14-15/09/2018
- Certificate for national faculty of " AO Trauma course – Orthogeriatrics and Fragility Fractures Treatment" /subspecialty course/, 12-13/ 11/ 2017
- Certificate for national faculty of " AO Trauma Regional Courses- Basic in Operative Fracture Management", Sofia, Bulgaria, 12-15/ 10/ 2017
- Certificate of ESTES Congress 2017 /poster presentation/ – 06 – 09/ 05/ 2017, Bucharest, Romania
- Certificate for Faculty Development " AO Foundation Faculty Education Program" as Faculty Development participant - 28-29/ 04/ 2017, Prague, Czech Republic
- Certificate of " BOTA- AAOS Elbow course"- Sofia, Bulgaria, 29/ 09/ 2016
- Certificate for national faculty of " AO Trauma Course - Advanced Principles of Fracture Management", Sofia, Bulgaria, 26-28/ 02/ 2016
- Certificate of " Osteosynthesis at the lower extremities and Workshop on the surgical anatomy of the access regions", Aschau and Jena, Germany, 13-14/ 11/ 2015
- Certificate of „ AO Trauma Europe Masters Course — Bone Reconstruction", Sofia, Bulgaria, 08-09/ 05/ 2015
- Certificate of „ Comprehensive Shoulder Course - AAOS", Timisoara, Rumania, 23-24/04/ 2015
- Certificate of "AO Trauma European Faculty Seminar" with participation and presentation of case report, Davos, Switzerland, 06-07/12/2013
- Certificate of "Polytrauma Symposium", Zagreb, Croatia, 01-02/03/2013
- Certificate of "AO Trauma Regional Courses - Advances in Operative Fracture Management" /EACCME/, Portomaso, Malta, 14-17/05/2011

- Certificate of “One day Shoulder Course”, organised by Prof. Stefaan Nijs and Prof. Dian Enchev, Sofia , Bulgaria, 13/04/2011
- Certificate of “ AO Trauma Regional Courses- Principles in Operative Fracture Management” /EACCME/, Sinaya, Rumania, 22-25/06/2009
- Certificate of radiology and nuclear medicine, Medical University-Sofia, Unit of radiology and nuclear medicine, Sofia, Bulgaria, 2003
- Certificate of radiologic anatomy, Medical University-Sofia, Unit of Anatomy and Histology, Sofia, Bulgaria, 2000.

Kyurkchiev, MD is a member of the Bulgarian Medical Association since 2005, of BOTA / Bulgarian Orthopedic and Traumatology Association / since 2009, of "AO Trauma Europe" since 2011 and of the "Bulgarian Foot and Ankle Society” (BFAS) from 2016.

He holds the following certificates for specialized activity: Diploma for „Arthroscopy“№ 055/ 14.01.2015; Diploma for “Total joint replacement” № 3322/17.06.2014; Visa and recognition of diploma for medicine in Belgium-06/05/2012; Diploma for French language DELF B2 - 12/04/2012.

At a meeting of the Scientific Council of the UMHATEM "N.I. Pirogov ”, held on June 12, 2019, I was nominated and selected as a member of a scientific jury in the procedure for awarding an educational and scientific degree “Doctor” (PhD) in the specialty “Orthopedics and traumatology”.

The topic of Kyurkchiev's dissertation is in the area of fractures of the proximal humerus, and as the author says, despite the advances in modern medical diagnostics and the introduction of new implants and treatments, the issue of their surgical treatment remains debatable and raises many questions in front of the trauma surgeon.

Kyurkchiev's dissertation is written on 134 standard pages. It is illustrated with 82 figures and 25 tables. It is structured in the usual way for a dissertation, and the normal relationships between the sections are respected.

The bibliography includes 167 titles, one of which is a publication of Bulgarian authors who have worked in the field of shoulder traumatology and

osteosynthesis. In connection with the dissertation, three scientific publications were presented, printed in Bulgarian scientific journals and other in foreign one.

The purpose of the work is stated clearly and precisely. To apply the method of osteosynthesis with locking angularly stable plates in the treatment of fractures of the proximal humerus /FPH/ and to make a critical analysis of the results and the complications that have occurred. The 5 **tasks** set for solving it were accomplished and allowed the author to achieve it convincingly.

First of all, I would like to point out that the dissertation is written very competently by a person who is deeply involved in the problem. The literature review made is complete and allows those interested in the problem to obtain the necessary information and knowledge.

The subject of the dissertation are **93** patients with **94** proximal humerus fractures (FPH), operated on and monitored for a period of one year (April 2015 - April 2016) at the Complex of Orthopedics and Traumatology at UMHATEM "N. I. Pirogov". A standard preoperative protocol was applied in all 93 patients. Patients in the cohort were diagnosed according to the Neer X-ray trauma series, including: true A-P, lateral "Y-scapular" and axillary views. As the most readily available for interpretation has been selected the Neer classification, on which is based the analysis of the results. Three types of approaches to the proximal humerus were used: deltopectoral (DPA), transdeltoid (TDA) and anterolateral (ALA). All patients are operated with first and second generation angle stable locking plates. The statistical analysis of functional results is based on two of the most commonly used assessment systems worldwide: the Constant-Murley Shoulder Score and the DASH Score.

At the end of the "**Results and Complications**" section, the author points out that good restoration of bone morphology, as close to anatomic as possible, and stable fixation, allowing early rehabilitation, are paramount for good and predictable outcomes and also are conditio, sine qua non.

After an adequately presented discussion of the final functional and radiological results and comparing them with the results of other authors in the world literature who worked on the same topic, the doctoral worker states, that despite the large proportion of patients with complications - **59 (63,44%)**, which, in his opinion , is

due primarily to the type of fracture, the quality of the underlying bone and the sensitivity of the shoulder joint to the trauma, the high percentage of patients with excellent, good and satisfactory final functional results - **73 (77,66%)** indicate that the angularly stable locking plates are an appropriate tool for surgical treatment of FPH, in condition that we know well the anatomy of the shoulder, do not underestimate the fracture morphology, comply strictly the operative technique of each implant and appoint appropriate at time and duration rehabilitation.

The conclusions of the dissertation show the objectivity of the work and the report of intraoperative errors do honor to the author:

1. Stable fixation was achieved in **82 (87,23%)** patients, good reduction in **54 (57,45%)** and excellent and very good final functional results in **49 (52,13%)**.
2. In **59 (63,44%)** patients there were complications, with **45 (48,39%)** of them having made **56** intraoperative errors.
3. The results of our study are comparable to those of other authors using bio statistical methods of analysis.
4. We believe that surgical treatment of FPH with angularly stable locking plates is an anatomically, biomechanically and functionally robust therapeutic approach, which gives us reason to recommend it as a method of choice.

The contributions of the dissertation are qualitative and I emphasize the algorithm for definitive conservative and operative treatment of FPH, created by the author.

1. For the first time in our country the problems of the proximal humeral fractures and their treatment with angularly stable locking plates are deliberately, comprehensively and thoroughly discussed.
2. The clinical and biomechanical aspects of the problem are analyzed in detail, based on a thorough literature review, and the possibilities, advantages and disadvantages of PHLP treatment are discussed.
3. The indications and contraindications for the application of the method under consideration shall be specified.

4. Based on worldwide approved evaluation systems – CSS and DASH, the following final results are reported: 20,21% excellent, 37,23% good, 26,6% satisfactory and 15,96% bad.
5. The correct statistical analysis shows that, with good anatomical reduction, the positive results of treatment with angularly stable locking plates are prevalent, despite the high frequency of complications and intraoperative errors. In our literature, our study is unparalleled.
6. An algorithm for definitive conservative and operative treatment of different types of FPH was developed and presented, refining the indications for the application of different types of implants.

CONCLUSION: The dissertation presented for defense represents an in-depth study of the importance of osteosynthesis with angularly stable locking plates in FPH. This method is a sufficiently robust treatment method offering good anatomical and functional final results, significantly reducing the incidence of incapacity for work and permanent disability, in condition, of course, that good reduction and stable fixation of the fracture are achieved to allow the initiation of early postoperative rehabilitation.

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

For this reason, I believe that the dissertation work of Boris Emilov Kyurkchiev, MD meets all the requirements for obtaining the educational and scientific degree "**Doctor**" and I propose that it be awarded.

October 25, 2019 **REVIEWER:**

(Prof. N. Tzachev, MD, PhD)