REVIEW

By Assoc. Prof. Dr. Svetoslav Lachezarov Dobrilov , MD.

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Regarding: scientific work of Dr. Petar Valentinov Petkov on the topic: " Post-traumatic stiffness in the elbow joint " for the acquisition of the educational and scientific degree "Doctor of Medicine".

By order of the Rector of the Medical University - Varna No. P- 109 - 46 / 1 of 6.01.2026 , I am appointed as a member of the Scientific Jury and by the latter's decision (Protocol No. 1 of 28.01.2026) I am assigned to present a review of the dissertation work of Dr. Petar Valentinov Petkov , doctoral student at the Department of Orthopedics and Traumatology , Faculty of Medicine of MU - Varna for the acquisition of the educational and scientific degree "Doctor of Medicine" in the scientific specialty "Orthopedics and Traumatology", in the professional field 7.1 "Medicine" from the field of higher education 7. "Healthcare and Sports".

The loss of range of motion and stiffness of the joints are a common complication after trauma or surgery. The more mobile a joint is, the more significant any loss of range of motion is. The process is defined as arthrofibrosis and is significant challenge for patients, orthopedic surgeons and physiotherapists, accompanied by unsatisfactory results and a number of complications . Its etiology is complex and multifactorial, with no guarantee of successful treatment. The elbow joint, as a complex articulation of three bones, providing a specific range of motion, is also not spared by this pathology. The scarce soft tissue coverage, its predisposition to everyday trauma and fractures, and its main connecting role in the upper limb are among the reasons why the stiffness of this joint has serious medical and social significance.

Joint stiffness affects patients of all age groups, although it is less common only in the pediatric population. The process of arthrofibrosis involves the formation of abnormal fibrous tissue around and in the joint, resulting from a hyperreflex inflammatory response to a traumatic stimulus. There is also idiopathic arthrofibrosis due to inflammatory arthropathy of non-bacterial genesis. This type of joint stiffness is less common in daily practice and is not the subject of the dissertation study.

At the cellular level, stiffness is characterized by a disruption of the normal cycle of cell growth, differentiation and apoptosis, affecting tissue homeostasis and organization. The final result of this pathological process is uncontrolled proliferation of fibrous tissue. The lack of programmed cell death (apoptosis) leads to a chronic, active inflammatory process with the formation of scar tissue with varying degrees of maturity. There is a deposition of collagen and extracellular matrix, which very quickly accumulate in the intercellular space and lead to increased fibrosis. The periarticular adhesions thus formed lead to contraction of the periarticular bursae and

tendons, loss of flexion and/or extension. In quite a few cases, fibrosed bursae can lead to impingement, followed by a new inflammatory response. The vicious circle thus formed leads to progressive stiffness and reduction of physiological volume. All of this clinically manifests as pain, stiffness, and decreased range of motion.

The specificity of the elbow joint and the lack of compensatory mechanisms from other joints to deal with stiffness make the problem significant. The lack of in-depth studies on this pathology make the topic disputable and scientifically significant.

The scientific work is 124 pages long , of which 20 pages are occupied by the bibliography and 10 pages by appendices . One page contains the goal and the 5 tasks set by the author to achieve it , and 4 working hypotheses. The other pages present the literature review, the clinical material, the methodology of its analysis, the own results and their discussion, as well as conclusions important for practice . The dissertation uses 9 tables, 19 figures and 7 graphs, all with serial numbers and titles in Bulgarian . The figures presented are of high quality and informative.

The bibliography covers 1 72 titles, of which 2 are in Cyrillic.

The literature review is detailed and takes up approximately 1/2 of the volume of the dissertation . It examines the publications relevant to the problem , systematizing them in a meaningful way . The following are presented sequentially:

- Detailed anatomy of the elbow joint with relevant bone-ligamentous structures and biomechanics
- Etiology of elbow stiffness illustrated with clinical cases.
- Detailed diagnostic algorithm: physical examination with goniometry and extrapolation of the finding to modern assessment scales - MEPS, DASH and Liverpool elbow score.
- Classification of elbow stiffness according to localization (Morrey's); structural (Kay), functional according to the degree of involvement of a specific volume (Vidal 's) and the most recent and probably complex classification - the STIF classification.
- More than half of the volume of the review is focused on the methods of treating elbow stiffness. Conservative methods such as various options of immobilization; physical methods and rehabilitation, manual therapy and myofascial release techniques are considered. The deadlines after which surgical treatment is initiated are clearly defined. Logically, special attention is paid to arthroscopic techniques for arthrolysis and the specifics of its implementation. I admire the author's effort to focus on minimally invasive techniques for treating stiffness, in the light of modern trends in orthopedics and traumatology. The "classical" open arthrolysis and elbow arthroplasty with various designs of elbow prostheses are next addressed.

The literature review is specific to the dissertation and is analytically arranged. Contemporary interpretations of the problem are covered and systematized in the aforementioned review.

The goal set by the author is clearly formulated in Chapter II: to make a comparative assessment of functional recovery according to the factor of the onset of movement in 2 groups of patients with diagnosed post-traumatic elbow stiffness. To fulfill the goal, 5 main tasks have been set, which focus primarily on the comparative analysis of the two studied groups. They are logically justified, stem from the goal set and are realistically feasible.

Four hypotheses have been formulated with an emphasis on the duration of immobilization and the timing of its application.

In Chapter III , in volume 6 pages, are The clinical material and the methods used in the study are also presented . It covers a period of one calendar year. and the study participants were divided equally into two groups of a total of 90 The difference between the two groups is the time for the start of movement - 14th and 30th day. The study was conducted in the Department in Orthopedics and Traumatology, Hospital " Maichin Dom" - Varna in the period from April 20 24 d — April 202 5 years. The study protocol includes a questionnaire, functional status, VAS (visual analog scale) for pain, MEPS (Mayo Elbow Performance Score) rating scale . The methods for treating post-traumatic stiffness include various techniques used in physical and manual therapy. I consider it appropriate to note that there is no detailed description of the various techniques used in the study and their standardization for each patient in both groups. This would lead to more clarity on the author's methodology in the treatment of stiffness of the elbow joint. The statistical methods used for processing and analyzing the information related to this dissertation are descriptive and analytical. The standard value 0.05 is set for the threshold value of the level of statistical significance . Descriptive statistical methods are simplified, which probably aims to make the data obtained by the author easier to understand. Analytical methods include t-test for independent samples and t-test for paired samples. When comparing variables, the chi-square test was used.

The results of the study are correctly presented in Chapter I V in 13 pages and are visually supported by numerous tables . The design includes 90 patients , equally distributed by gender and intervention. The age of the patients is impressive - an average of 46 years, which shows the high medical and social significance of the problem affecting people of active and working age. In tabular form, the author clearly presents the results of the study. His conclusion is that early mobilization and the application of the methods described in the study lead to higher functional results, prevention of stiffness and overcoming of stiffness that has occurred.

In the following Chapter V, which is 7 pages long , discussion of own results, compared and supported by data from the literature. The dissertationist analytically compares the obtained results with the available literature data. It is noticeable that the author has used data from the last 5 years for references, which brings additional weight to the obtained results. Despite the widely accepted opinion about the aggressiveness of surgeons, the author emphasizes conservative methods for treating stiffness and puts the timing of starting these methods first. The results of Dr. Petkov,

compared with those available in the literature, confirm the dominant importance of early mobilization in terms of increasing the volume of movement, functional outcome and reducing pain. The study logically shows that any delay in mobilization after the 30th day leads to poor functional results, reduced volume of movement and dissatisfaction in the patient. Statistically significant results have been reported with a conservative approach to post-traumatic elbow stiffness and guidelines for behavior in the event of such occurrence are given.

The discussion concludes with a critical analysis of the strengths and weaknesses of the study. One of the advantages of the study is the clear presentation of the methodology and its easy application in daily practice, without the worry that the results are unpredictable due to gaps in the methodology. The clear definition of the time interval for starting the mobilization techniques is the essence of the study. The author also critically notes the shortcomings of his work, related to the short period of the study and the small population included in his study. I consider it appropriate to note that the number of patients in the study is sufficient to draw practical conclusions.

In Chapter VI, within a page, the author's conclusion from his research is formulated in a concise form. The main clinical groups in practice are clearly defined - post-traumatic and iatrogenic, with the dominance of therapeutic results in the first. The complex approach to patients with elbow stiffness is essential in everyday practice and the applied kinesitherapy protocols undoubtedly lead to successful results.

In the following chapter VII, five conclusions are stated, logically derived from this work . On the dissertation topic, Dr. Petkov presents 2 publications (all of which meet the criteria for real publications) in Chapter VIII . They have been published in peer - reviewed journals that meet the Minimum Requirements for Area 7. Health and Sports, according to the Regulations for the Implementation of the Act on the Development of Academic Staff in the Republic of Bulgaria of 2018. They contain separate parts of the developed material.

In Chapter I X, the bibliography is arranged alphabetically and the literary sources are written in a uniform style.

My submitted dissertation abstract in a volume of 52 pages is formatted according to the requirements .

In conclusion, the dissertation work presented to me for review shows, above all, the ability of the dissertationist to put forward a scientific thesis, a methodology for its solution. His ability to select and process material, as well as to make statistically reliable conclusions on a topical and specific topic - " Post-traumatic stiffness in the elbow joint ". Separately, I consider it appropriate to note the prospect of the present work for further development, which carries additional scientific and practical weight. The conclusions made in the study are easily applicable in the everyday life of the clinician and should be taken into account by anyone who deals with this serious pathology.

The dissertation fully meets the qualitative and quantitative criteria set out in the Requirements for Dissertation Work for the Acquisition of the Educational and Scientific Degree "Doctor" of the Medical University of Varna. Therefore , I give a positive assessment of the work

and call on the esteemed members of the scientific jury to award Dr. Petar Valentinov Petkov the educational and scientific degree " **Doctor of Medicine** " in science . specialty ..Orthopedics and Traumatology".

Assoc. Prof. Dr. Svetoslav Dobrilov

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