

**To the Chairman of the Scientific  
Jury appointed by order of the  
Executive Director of NHH  
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## **OPINION**

by Prof. Dr. Detelina Valchkova Lukanova, MD, PhD  
Head of the Department of Angiology at the National Cardiology Hospital  
Chairman of the scientific jury for the competition for acquiring educational and scientific  
degree "Doctor" in the field of higher education 7. "Health and Sport", professional field 7.1."  
Medicine" and scientific specialty "Cardiovascular surgery" with code 03.01.49

on the provided dissertation and auto abstract on the topic:

### **"COMPARATIVE ANALYSIS OF TREATMENT METHODS IN CHRONIC TOTAL OCCLUSIONS OF ARTERY FEMORALIS SUPERFICIALIS"**

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**Scientific supervisor:** Professor Mario Stankev, MD, PhD

Cardiovascular diseases are a group of diseases (coronary, cerebrovascular and peripheral artery disease) that share common risk factors and lead to the development of atherosclerosis, and very often the process is multifocal with simultaneous involvement of the three vascular beds.

Currently, more than 200 million people worldwide suffer from peripheral artery disease (PAD). The prevalence of PAD is directly related to age, increasing by over 10% among patients in the sixth and seventh decades. The ageing of the population and the continuous increase in the severity of risk factors will inevitably lead to an increase in the number of patients with PAD and its transformation into a major socially significant disease, which is associated with high morbidity, disability, mortality and medico-economic costs. Chronic total occlusions (CTO) of the arteries of the lower extremities constitute the main share of diseases included in the group of PAD, the most common localization being the superficial femoral artery (a. femoralis superficialis /AFS/).

The therapeutic approach in patients with chronic AFS occlusions involves two main aspects. The first aims to reduce the overall cardiovascular risk given the multifocal nature of atherosclerosis. Optimal drug therapy aims to influence risk factors (arterial hypertension, dyslipidemia, diabetes) in combination with guidelines for a healthy lifestyle, smoking cessation, reduction of body weight and daily physical activity. The second aspect concerns symptoms directly related to PAD (controlled exercise programs, vasodilator intake, endovascular,

operative or hybrid treatment).

In the last decade, data from numerous studies and meta-analyses on the effectiveness and safety of different methods of revascularization – operative, endovascular and hybrid – were published. However, there is still no consensus on the matter.

Open surgery is the "doyen" in the treatment of AFS CTOs. The beginning was set at the end of the 19th century and it has undergone rapid improvement in the next century to the present day. It is developed by optimizing the tools and sewing materials, developing synthetic prostheses, refining vascular anastomoses, introducing heparin and angiography. Subsequently, the surgical technique itself did not change significantly, but improvements were introduced in order to increase the patency of the reconstructions and less complications. Surgical treatment can be divided into two types - proximal femoro-poplite bypass and semi-closed endarterectomy. There are several important stages in their implementation - operational accesses, selection of graft material and construction of anastomoses, conducting deorbiteration and evacuation of the preparation.

Endovascular treatment in PAD is one of the fastest growing areas of modern medicine. The factors for this are several – minimal invasiveness, continuous improvement of the consumable, more and more experienced operators. It is expected that in the near future about 80% of all vascular interventions will be endovascular. The methodology used to treat AFS CTO can be divided into several stages – access, redrainage, vessel preparation and definitive treatment to ensure that the vessel remains open. Complications and treatment are important.

Hybrid surgery is a combination of open surgery and endovascular procedure. It has some significant advantages. Open access allows for one-stage treatment of the femoro-popliteal and iliac segments. Another advantage is access to AFC and APF and the ability to surgically correct atherosclerotic changes in them. Hybrid surgery is particularly suitable for the so-called "flush" occlusions or occlusions without "knocked" AFS, as in them antegrade recanalization is almost impossible and retrograde access is necessary. Another advantage is the possibility of remote endarterectomy of long occlusions and thus a drastic reduction in the number of implants, as well as the lack of a large synthetic material. Particularly suitable for hybrid procedures are patients with subacute AFS occlusions, where thrombectomy and stenting are required.

The dissertation paper is presented on 233 standard pages and contains 111 tables and 55 figures. The bibliography includes 276 literary sources, of which 5 in Cyrillic and 271 in Latin.

The content of the dissertation includes: Introduction - 1 page, Literature review - 46 pages, Purpose and Tasks of the study - 1 p., Material and Methods - 18 pages, Results - 56 pages, Discussion - 80 pages, Conclusions (9), Author's contributions (9) and Bibliography.

At the beginning of the literature review, the epidemiology, etiopathogenesis, clinic and diagnostics of PAD are discussed. Further, the dissertant in detail has focused on the methods of treatment – conservative and invasive. The indications, contraindications, advantages,

disadvantages and complications of surgical methods of treatment (open surgery, endovascular procedures and hybrid surgery) are indicated. Special problems in patients with chronic ischemia threatening the limb are described. At the end of the review, the unresolved problems in the treatment of atherosclerotic lesions of the peripheral arteries are discussed.

One of the biggest challenges remains the systematization and optimization of the algorithms of behavior in chronic total occlusions of AFS, subject to good medical practice and supported by scientific evidence. That is why the topic of the dissertation is extremely topical. In the Bulgarian literature so far there are no studies comparing the effectiveness – early and long-term, and the complications of different methods of surgical treatment of this type of vascular pathology.

The aim of the dissertation is precisely and concretely formulated: to conduct a comparative analysis of the methods of treatment in chronic total occlusions of AFS.

The six tasks set correspond to the formulated objective. The most important and with the greatest practical application in clinical practice are the first, second, third and sixth task: to determine the primary, primary assisted and secondary patency in each of the methods of treatment, both in the whole group and in the subgroups of patients with diabetes and chronic ischemia threatening the limb; to establish the influence of risk factors on patency in the three methods of treatment; to establish the influence of previously performed reconstructions (overstanding, same, and sub sequential segment) on the patency of the present reconstruction and to construct a treatment algorithm in patients with AFS CTO.

Use from the author the materials and methods on the study and describe in detail the protocols for all types of surgical treatment and meet the etapi, dost'pi and consumative. Describe the sa and complications, how and start for the removal of them. This is evident in the results, presented separately for any methodology, which facilitates the reading and perception of the large volume of data. Those are a lot of good in tables and diagrams.

In the discussion, the author was able to synthesize the results of the analyses by critically comparing them with the recommendations of modern guidelines for the treatment of PAD, highlighting the retrospective nature of the study and the time interval in which it was conducted (2012–2017). In the established sequence the own results have been compared with those of other authors presented in the literature review. It is noteworthy to discuss studies published in the last 2-3 years. It is emphasized that the basis of the good results of the team of specialists is the correct selection of patients suitable for each type of treatment, as well as the experience of the operator.

The author defends his position that despite the presence of many terms used to assess the effect of revascularization, patency remains the most important indicator for tracking the result of the treatment and the comparison of individual methodologies in order to build a therapeutic algorithm. In primary patency, there was a gradual decline for the three methods of treatment in

the first 12 months, with the best in endovascular treatment. Primary assisted patency was followed constant until the end of the first year in endovascular and hybrid treatment, and here the latter was better (by 11.71%). Open surgery showed the lowest results, with primary assisted patency decreasing by 3/4 at 12 months. Secondary patency is highest in endovascular treatment and at the end of the first year it decreases by about 30%. Open and hybrid surgery showed similar results at the first month with a secondary patency of about 50%. In hybrid treatment, patency remained the same until the middle of the year, after which it declined and reached 27.8%. The operating method shows the worst secondary patency with complete loss at the 3rd month.

The influence of previous reconstructions on patency is of great interest. The results are synthesized in one of the conclusions.

In patients with AFS CTO, concomitant CVD amounted to 45.2%, and it was most prevalent among those with hybrid treatment, mainly at the expense of asymptomatic carotid stenosis. Concomitant CAD was 20% without significant difference across groups. Simultaneous involvement of the three vascular beds was found in 11.14%.

Extremely valuable are the therapeutic algorithms for surgical and endovascular treatment of AFS CTO, presented at the end of the dissertation. They summarize the results of the large-scale study of the author, as well as the recommendations laid down in modern manuals. The emphasis is placed on the group of patients with revascularization, because there is no consensus here and the decision is individual for each patient depending on multiple factors.

With his conclusions, the author demonstrates the practical value of the conducted research. The most important of them are: endovascular and hibiyrde treatment are associated with better patency (primary, primary assisted and secondary) both in the overall group and in the subgroups of patients with diabetes and chronic ischemia threatening the limb; the greatest benefit from surgical treatment would be given to patients with a life expectancy of more than two years; in AFS surgical treatment only the previously performed reconstructions in the femoral segment are important, and in the hybrid – those in the superior aorto-iliac segment, and in both cases patency is significantly better in the initial treatment; In endovascular treatment, the previously performed reconstructions in the aorotto-iliac and femoral segments do not affect patency.

The nine own scientific-practical and confirmatory contributions listed by the author are important with their applicability in daily clinical practice to improve the outcome of surgical revascularization in patients with AFS CTO.

As a weakness of the dissertation, I would point out that the author has not reflected the limitations of his research. Its retrospective nature determines the loss of follow-up of some patients, which deforms the curves of primary assisted and secondary patency in the whole group and subgroups with diabetes and chronic ischemia threatening the limb. There is no Application with the Patient's card that reflects the data for each patient.

Dr. Stoyanova meets the minimum national requirements under Art. 1, para. 4 of the Law on the Development of the Academic Staff, the regulations for its application and the Regulations for the conditions and procedures for acquiring scientific degrees and holding academic positions in the MHAT "NHH" EAD to the scientific activity of candidates for the acquisition of the educational and scientific degree "doctor" as with a required minimum of 80 points she collects 87 points.

In conclusion, I believe that the presented dissertation shows that the doctoral student Dr. Boyka Ilieva Stoyanova possesses theoretical knowledge and professional skills in the scientific specialty of Cardiovascular Surgery, demonstrating qualities and skills for independent conduct of scientific research.

Due to the above, I confidently give my positive assessment of the conducted research, presented by the above-reviewed dissertation work and abstract, and I propose to the honorable scientific jury to award the educational and scientific degree "doctor" to Dr. Boyka Ilieva Stoyanova.

10.05.2023

Prepared by:



(Prof. Detelina Lukanova, MD, PhD)