

## Quantitative Intima-Media Correlations in the Vessel Wall of the Lower Limb at Patients with Chronic Arterial Insufficiency of the Lower Limb

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In the present study a comparison is made between quantitative parameters of the walls of different vessels in the lower limb. It is a point of discussion how much the way and degree of remodelling of the venous wall influences the outcome of the auto transplantation procedure. We decide to use I/M index as a criterion with high authenticity about changes in the vessel wall. For the assessment we used diagram of dispersing and correlative analysis. The results of quantitative analysis show that this index has well expressed correlative dependence with the intimal thickness.

*Key words:* chronic arterial insufficiency of the lower limb, vessel wall, remodelling.

### Introduction

Chronic arterial insufficiency of the lower limb induces changes in the vessel walls marked with the term remodelling. It is a point of discussion how much the way and degree of this remodelling influence the outcome of the autotransplantation procedure. In all cases the objective assessment of vessel wall condition needs qualitative analysis as well as quantitative one. It is possible for the both layers - intima and media. In the present study a comparison is made between quantitative parameters of the walls of different vessels in the lower limb.

### Materials and Methods

A biopsy material from 9 a. femoralis, respectively a.poplitea, 6 v. femoralis and 16 v. saphena magna taken intraoperatively in the Clinic of Vascular Surgery at Medical University of Varna from patients with chronic arterial insufficiency of the lower limb II-III or III-IV degree at the moment of reconstruction with the help of autograft saphena bypass from the same limb and III-IV or IV degree, which has led to

gangrene and amputation, was studied. The biopsy material was fixed in 10% formalin and was soaked through paraffin and histovax. Histological sections were prepared with 5 μm thickness, colored by hematoxiline-eosine, with Orcein, Azan and by the methods of Van Gieson and Mallory. They were studied and photographed under Microscope Olympus BX50, equipped with video camera. The thickness of intima and media in the arterial and venous walls were measured upon digital images with the help of the program Image tool Version 3.00 (The University of Texas health Sciences Center in San Antonio.) The transversal dimensions (thickness) were measured in radial direction on regular intervals along the vessel circumference. On the next stage the proportion intima-media was calculated.

In all stages of the study the ethical standards of work with biopsy and necropsy materials were kept.

## Results

The results from measurement of intimal and media thickness in the three kinds of vessels were put in tables. The average arithmetical value, standard deviation and the proportion of the thickness intima-media were calculated. The results were graphically presented.

The diagram of dispersing (Scatter plot) about gathering of the points, visually presents the availability, types and the intensity of the existing correlations. The presented diagrams of the three vessel types illustrated the positive correlation between intima-media and intimal thickness (Fig. 1). At the same presentation towards media arbitrarily dispersing of points shows lack of correlation (Fig. 2).

On the next stage as resumed index of the correlation degree we used the correlative coefficient of Pearson-R

The assessment of the result was made in both most used for this type correlative analysis scales:

$$Correl(X, Y) = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sqrt{\sum (x - \bar{x})^2 \sum (y - \bar{y})^2}}$$

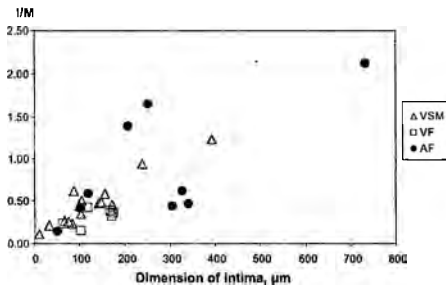


Fig. 1. Diagram of dispersing of intima

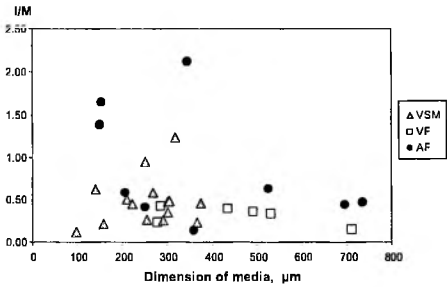


Fig. 2. Diagram of dispersing of media

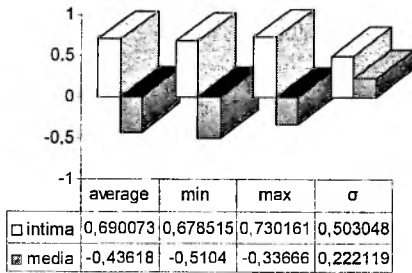


Fig. 3. Index of correlation Pearson Af

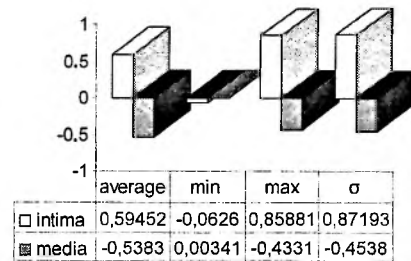


Fig. 4. Index of correlation Pearson VF

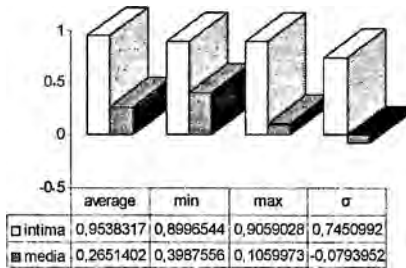


Fig. 5. Index of correlation Pearson VSM

I

0<R<0,3 - slight correlation  
 0,3<R<0,5- moderate correlation  
 0,5<R<0,7 - significant correlation  
 0,7<R<0,9 - high correlation  
 0,9<R<1,0 - very high correlation

II

0-0,2 - slight correlation  
 0,2-0,4 - moderate correlation  
 0,4-0,6 - significant correlation  
 0,6-0,8 - high correlation  
 0,8-1,0 - very high correlation

In arterial vessels R presents significant correlation in I<sup>st</sup> scale and high correlation in the II<sup>nd</sup> scale of I/M index with the intimal thickness. The results about the media show respectively moderate negative correlation in I<sup>st</sup> scale and significant negative correlation in the II<sup>nd</sup> scale (Fig. 3). About deep veins of the lower limb R presents significant and high correlation in the I<sup>st</sup> scale and high correlation in the II<sup>nd</sup> about I/M index with intimal thickness. About the media the results show respectively moderate negative correlation in the I<sup>st</sup> scale and moderate and significant negative correlation in the II<sup>nd</sup> scale (Fig. 4). About superficial veins of the lower limb R presents very high correlation in I<sup>st</sup> scale and very high correlation in the II<sup>nd</sup> scale of the I/M index with the intimal thickness. About the media results show respectively slight correlation in both scales (Fig. 5).

## Discussion

The presented analysis aims unification of method of assessment of the lower limbs vessel conditions under the effect of chronic arterial insufficiency of the lower limb. It is obvious that using of absolute quantities in cases of clinical and laboratory researches is imprecise because of individual, age, sex, races and other peculiarities of every patient. With such motivation we decide to use I/M index as a criterion with high authenticity about changes in the vessel wall. The results of quantitative analysis show that this index has well expressed correlative dependence with the intimal thickness. Vessel media of the three groups presents slight or negative correlation with I/M index. We think it's due to the fact media is more stable to ischemia and even in cases with severe damages intima and adventitia keeps its structures.

Changes in I/M index correlate directly with intimal changes and can serve for assessment of vessel wall conditions.

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