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Femoral Vein Wall Remodelling in Chronic Arterial Insufficiency of the Lower Limb

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Key words: femoral vein, lower limb, remodelling.

Introduction

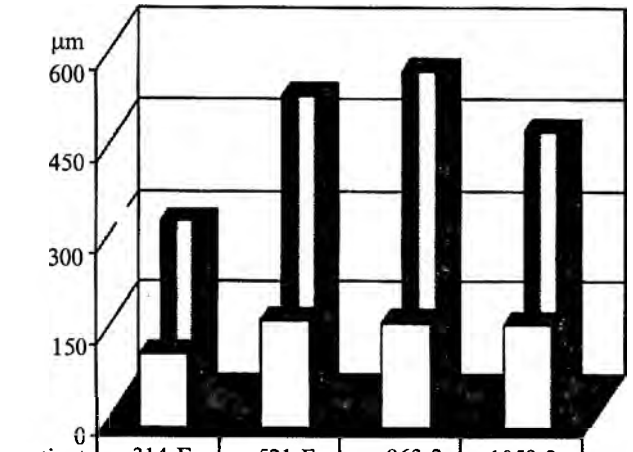
Usage of great saphenous vein (GSV) as an autograft during reconstructive operations of arterial vessels is limited in a considerable number of patients that requires the introduction of alternative autografts [3, 4]. Femoral vein (FV) offer such an opportunity [6, 9]. The objective of the present study is to investigate the remodelling of the wall of FV in patients with chronic arterial insufficiency of the lower limb (CHAILL) with a view to assess the possibilities for its application as an autograft.

Material and Methods

One FV taken intraoperatively from 4 amputated limbs in the Clinic of Vascular Surgery, Medical University of Varna, was fixed in 10% formalin and embedded in paraffin or Histowax. Five μm-thick sections were stained with hematoxylin-eosin (HE), orcein, AZAN and by the methods of Van-Gieson and of Mallory and then examined with OLYMPUS BX-50 microscope. Representative areas from sections filmed using video-camera were quantitatively examined by means of Image Tool 3.00 software (The University of Texas Health Science Center in San Antonio, TX, USA).

Results

No fresh fibrin coatings and thrombotic masses are observed on FV luminal surface. The greater part of tunica intima is covered by endothelial cells. The thicknesses of the tunica intima, tunica media and tunica adventitia vary according to the circumference of FV not only in one and the same patients but also in single patients. The ratio between the thicknesses of the media to that of the intima is variable, too (Fig. 1) as the differences in the thickness of the media are considerably less ex-



patient	314-Г	521-Б	963-2	1059-2
intima	118.96	174.43	171.73	168.13
media	285.53	492.36	531.83	435

Fig. 1 Average size of the thikness of femoral vein

pressed. The smooth muscle cells (SMC) are longitudinally oriented. Their amount is greater subendothelially and in the proximity of the media. Single and even numerous SMC presenting with differently manifested vacuolization of the cytoplasm are observed at various places, more commonly subendothelially, in the intima which does not involve all the cells (Fig. 2). Elastic structures form a network as at the borderline to the media an internal elastic membrane is created. At certain places a subendothelial membrane-like accumulation of elastic fibres is observed, too. In some areas there is a reduction of the elastic fibres due to the incorporation of an old organized thrombus (Fig. 3). The collagen fibres form a spatial network that is densest close to the media.

SMC in the media build-up circular layers. Vacuolized SMC are absent. Between SMC bundles, single or grouped thick elastic fibers and bundles of collagen fibers are located. Vasa vasorum are of relatively small size and reach up to the middle part of the media. In one case there is a scanty inflammatory cell infiltration in the media located to the adventitia.

SMC in the adventitia form longitudinal bundles of different thickness. Single or small groups of SMC amounting only up to 20-30% of their total number are vacuolized (Fig. 4). The bundles of elastic and collagen fibres are of different thickness and direction.

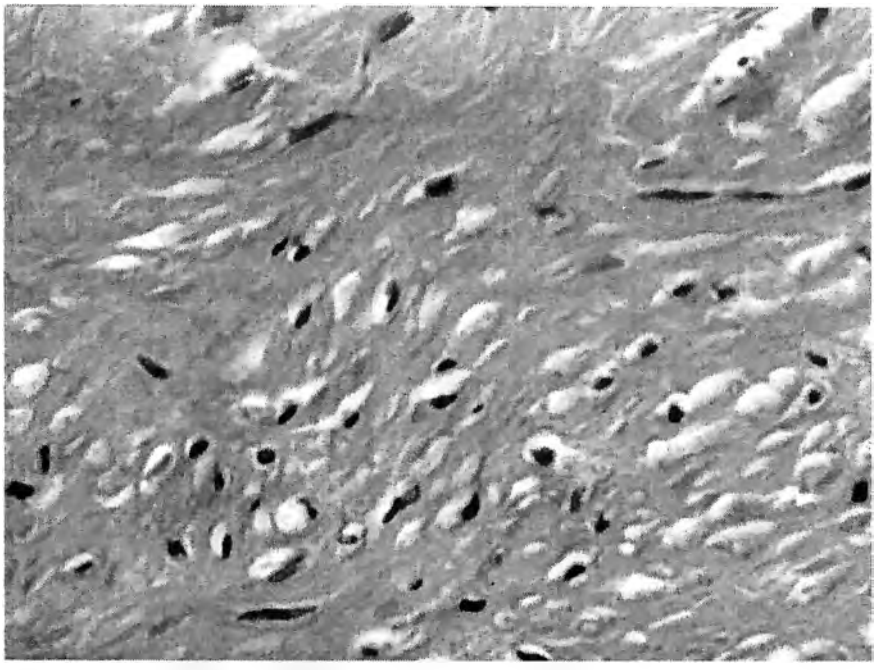


Fig. 2. FV. HE stain. Microphotograh (40×20)

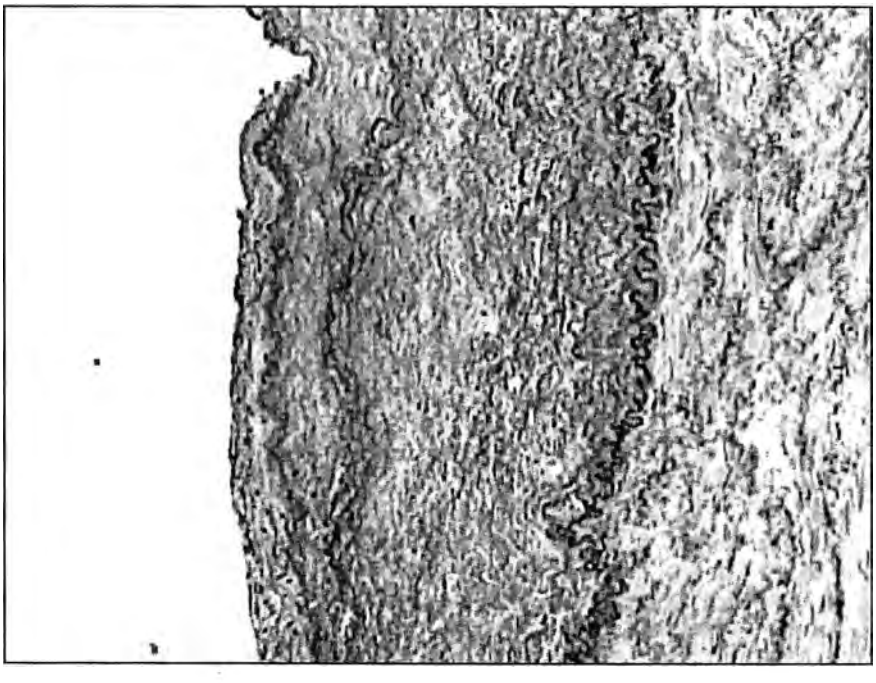


Fig. 3. FV. Orcein stain. Microphotograph (20×10)

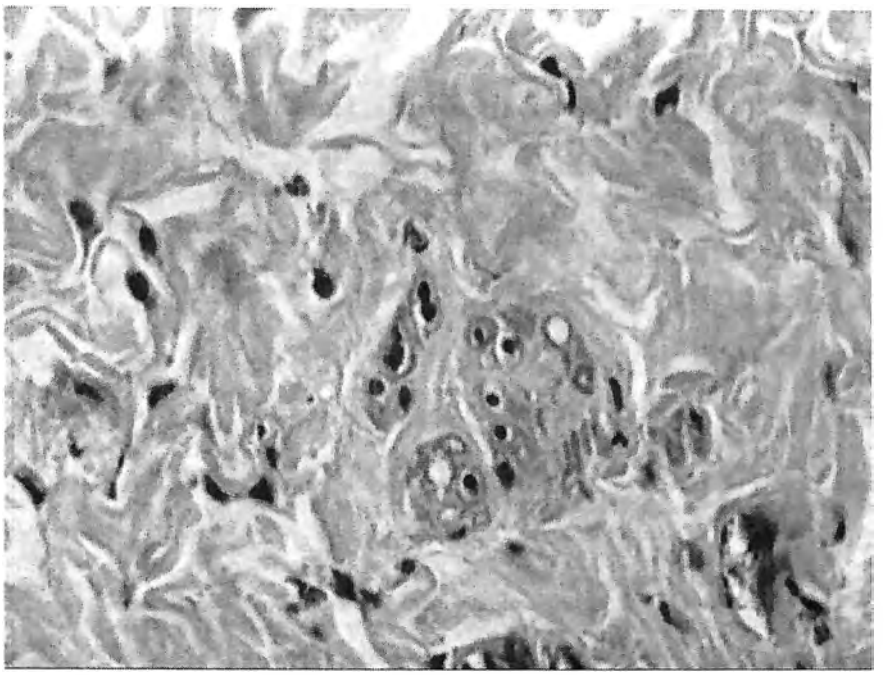


Fig. 4. FV. HE stain. Microphotograh (40×20)

Discussion

This first systemic investigation of FV wall remodelling in CHAILL presents important data about the assessment of the risk when using this vein as an autograft. During the development of CHAILL, FV wall undergoes a remodelling: changes occur in the thicknesses of the intima and media, in the ratio between them and in the arrangement of the elastic and collagen fibres. There is a reduction of the diameter of the vasa vasorum in the media and of the elastic fibres in some areas of the intima. SMC with differently manifested vacuolization of the cytoplasm are observed in the intima and adventitia as well. As the intracellular hypercytolipidemia compromises the cytoarchitecture of the cellular compartments [1] the lipid accumulation in the venous wall requires further research to clarify its significance for venous grafts' survival [2, 5, 7, 8]. Basic characteristics of the good venous autograft have been shown in our previous work [10]. The remodelled FV preserves a lot of these characteristics. Its diameter is sufficient and its lumen is free and partially well-endothelized. The intima, media and adventitia are sufficiently well-developed to maintain FV primary mechanical properties. The elastic skeleton is very well preserved and, probably, keeps FV elastic properties to a great extent. The collagen skeleton is well preserved, too, and likely ensures the necessary strength of the wall during its maximal stretching.

Conclusion

The remodelled FV wall in CHAILL preserves the basic principles of its structure. From this point of view, it does not yield to the remodelled GSV as a possible autograft. Taking into consideration the risk, the problem with the abundant SMC vacuolization in the intima and, to a lesser extent, in the adventitia of both veins remains insufficiently clarified yet. From a hemodynamic viewpoint, however, FV leading away from the venous circulation results in more significant circulatory disturbances than GSV one.

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