CONTRIBUTIONS TO THE DIAGNOSIS OF CHRONIC VENOUS INSUFFICIENCY OF THE PERFORATING VEINS

I. Avram¹, N. Bota², Mihaela Avram²

Summary: Based on our study group of 343 cases who underwent perforating veins surgery, representing 3.7% of the total of 9270 patients hospitalized for venous diseases in the First Surgical Clinic Timisoara during 1974-2006, we make some considerations regarding the diagnosis of insufficient perforating veins of the lower limb. Studying the etiological circumstances that led to surgery of the perforating veins, we observed the high incidence of the postthrombotic syndrome (291 Patients - 84.84% of cases), compared to 15.16% caused by complicated varicose disease. The diagnosis of insufficient perforating veins is based on clinical criteria, phlebographical and ultrasound explorations. Nowadays ultrasound has evolved as the imaging modality of choice, being the most used mean in determining the points of venous reflux. Ultrasound can be used to map the anatomy of the venous system, both normal and variant as well as the refluxing pathways, the sapheno-femoral junction and incontinent perforating veins. Analyzing the recurrence of varicose veins and venous ulcers after ligation of perforating veins, we concluded that they are mostly determined by errors in diagnosis and by inappropriate indications for surgery, due to incomplete clinical and imagistic examination. Omission to identify an incompetent perforating vein leads to omission in interruption of venous reflux, followed by relapse and aggravation of skin lesions. Deficiency in examination can lead to abusive surgical procedures in areas without insufficient perforating veins.

Keywords: perforating veins, chronic venous insufficiency, ultrasound, phlebography.

Introduction

A perforating vein can become incompetent due to hemodynamic or morphologic causes. Until recently all perforating veins with a diameter exceeding 3 mm at ultrasound exam were considered incontinent(1). Since introduction of duplex doppler and color doppler investigations this hypothesis was tempered because the dilatation of one or more perforating veins was usually observed in chronic venous insufficiency of the superficial veins, allowing the retrograde blood draining flow from the incontinent superficial veins to the deep venous system in standing position. These perforating veins substitute the normal function of the incompetent sapheno-femoral junction. In order to evaluate the incompetence of the perforating veins it is necessary to emphasize the valvular reflux from the deep venous system to a superficial vein(2, 3).

Material and Methods

We studied a number of 343 patients with incontinent perforating veins who underwent surgery in the First Surgical Clinic Timisoara during 1974-2006. Out of 9270 patients admitted for chronic venous diseases of the lower limbs, 6748 underwent surgery.

The research methods consisted mainly of studying the medical and surgical records, imagistic investigations, especially phlebographic and Doppler ultrasound findings. Data obtained by direct documentation was collected and processed considering the modern physio-pathological findings of the human venous circulation.

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Results and discussions

Our study group of 343 cases who underwent perforating veins surgery represents 3.7% of the total of 9270 patients hospitalized for venous diseases in the First Surgical Clinic Timisoara during 1974-2006. Also, the study group represents 5.1% of all patients who underwent surgery for chronic venous diseases in the same period.

Studying the etiological circumstances that led to surgery of the perforating veins, we observed the high incidence of the postthrombotic syndrome (84.84% of cases), compared to 15.16% caused by complicated varicose disease.

In table 1 we can observe the different etiopathogenic types of venous diseases we studied in order to diagnose the insufficient perforating veins.

<table>
<thead>
<tr>
<th>Types of venous diseases</th>
<th>Number of cases</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varicose veins</td>
<td>7426</td>
<td>80.2</td>
</tr>
<tr>
<td>Deep vein thrombosis</td>
<td>492</td>
<td>5.3</td>
</tr>
<tr>
<td>Post-thrombotic syndrome</td>
<td>1228</td>
<td>13.2</td>
</tr>
<tr>
<td>Trauma of lower limbs</td>
<td>46</td>
<td>0.5</td>
</tr>
<tr>
<td>Congenital venous malformations</td>
<td>78</td>
<td>0.8</td>
</tr>
</tbody>
</table>

Table 1. Patients with chronic venous diseases admitted in the First Surgical Clinic Timisoara during 1974-2006.

<table>
<thead>
<tr>
<th>Venous disease</th>
<th>Insufficient perforating veins - %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varicose disease</td>
<td>52 patients (15.16%)</td>
</tr>
<tr>
<td>Post-thrombotic syndrome</td>
<td>291 patients (84.84%)</td>
</tr>
</tbody>
</table>

Table 2. Insufficiency of perforating veins - distribution.

In order to evaluate the incompetence degree of the perforating veins we considered the following criteria:

a. Clinical criteria

A correct and competent anamnesis is the most valuable mean of evaluating the origin of the venous insufficiency (4). The existence of deep venous thrombosis in the medical history of a patient is sufficient to suspect the presence of an insufficient perforating vein. Regarding the incidence of insufficient perforating veins in primary varicose disease we noticed from anamnesis the long-time evolution of venous disease, with several complications, including skin changes.

The clinical exam must establish the presence of insufficient perforating veins, the presence of reflux and the location of reflux points. If voluminous a insufficient perforating vein can be sometimes noticed by digital examination as a lowering surrounded by hardened margins (5).

The complete exam of incontinent perforating veins consists of several clinical maneuvers, all of the based on the same principle: after emptying the superficial venous system of a lower limb we place a tourniquet under the sapheno-femoral junction to block the reflux at this level; if perforating veins are competent we observe a slow filling of the superficial veins of the calf; if perforating veins are insufficient, the reflux from deep venous system determines rapid filling of the superficial veins. We mostly used the Trendelenburg maneuver, the Perthes maneuver, and “Test of the three tourniquets” (5).

Currently these clinical maneuvers are replaced by ultrasound Doppler investigation, which is more efficient and precise (6).

Clinical exam and clinical maneuvers are usually scarce in diagnosing an insufficient perforating vein. Clinical exam can give us false positive results - in case of fascia dehiscence a varicose vein can be mistaken for an insufficient perforating vein, and false negative results in the situation of a perforating vein located in the paratibial area or in areas with skin changes.

The diagnosis of the location of the insufficient perforating veins is eased by the acknowledgement that large direct perforating veins, with predisposition to become insufficient are generally located in the same
anatomic regions; these regions represent useful coordinates in the clinical diagnosis of insufficient perforating veins (7, 8, 9).

Considering these aspects, we need to examine the following perforating veins:

- the Hunter in the mid thigh, the Dodd in the lower thigh, the Boyd in the upper calf, and the Cockett’s in the middle and lower calf, Sherman perforators in the lower and mid leg,
- Medial leg perforators, nominated as paratibial or posterior tibial. Paratibial perforators include Sherman perforating veins in the lower and mid leg and Boyd perforating veins in the upper leg; they connect the main saphen amagna trunk or its tributaries with the posterior tibial veins or calf muscle plexus and are located close to the medial surface of the tibia. Posterior tibial perforators or Cockett perforators connect the posterior arch vein with the posterior tibial veins, and are generally named Cockett I, II and III.
- Anterior leg perforating veins perforate the anterior tibial compartment fascia and connect anterior saphena magna tributaries to the anterior tibial veins.
- Lateral leg perforating veins connect veins of the lateral venous plexus with the peroneal veins.
- Posterior leg perforating veins are divided into medial gastrocnemius perforating veins in the medial calf, lateral gastrocnemius perforators in the lateral calf, soleal (intergemellar) perforators connecting the short saphenous vein with soleal veins (the mid-calf perforating vein of May), and para-Achillean perforating vein connecting the short saphenous vein with the peroneal veins (perforating vein of Bassi).

The clinical maneuvers were used for a long period, until introduction of Doppler ultrasound examination in the First Surgical Clinic of Timisoara. The tourniquets maneuvers have been generally replaced, but the direct clinical examination remains important especially in association with imagistic investigations.

b. phlebographical criteria

Venography was considered for a long time the “gold standard” in phlebology. The results of venography depend on the used technique: ascending contrast phlebography, descending contrast phlebography, selective phlebography, dynamic phlebography; the results depend also on the use of additional clinical maneuvers like the Trendelenburg maneuver, application of tourniquets (10).

In most cases ascending contrast phlebography of the lower limb was used. This technique consists of two stages: in the first stage is intended to investigate the permeability of the deep venous system, the morphological status of venous walls, the functionality of venous valves and the venous collateral circulation. The second stage allows us to appreciate the insufficient perforating veins of the calf and to identify the point of venous reflux (Fig. 2).

In medical literature the studies regarding phlebographic findings do not consent on the definition and number of incontinent perforating veins(11).

We obtained useful results using veinography, especially in detection of insufficient perforating veins in recurrent varicose veins and in patients with post-
thrombotic syndrome with secondary varicose veins and advanced skin lesions.

c. ultrasound criteria

Although a number of options exist for imaging the venous system, nowadays ultrasound has evolved as the imaging modality of choice, being the most used mean in determining the points of venous reflux (12).

No standard technique for the examination of perforating veins exists in the literature. After emptying the superficial venous system and application of a tourniquet in the upper third of the calf, each perforating vein was examined by the use of Doppler-ultrasound and by compression of the calf (Fig. 3.).

A vessel was determined to be competent when it exhibited only inward flow and to be incompetent when it was seen to allow deep to superficial venous flow, no matter whether the flow was unidirectional or bidirectional. Echo-doppler investigation allows us to record the maximum diameter of the incompetent perforating vein vessel.

Ultrasound can be used to map the anatomy of the venous system, both normal and variant as well as the refluxing pathways, the sapheno-femoral junction and incontinent perforating veins (13).

Preoperative skin marking is very useful for the surgeon, in order to choose the most appropriate therapeutic gesture for each incompetent perforating vein (14).

Analyzing the recurrence of varicose veins and venous ulcers after ligation of perforating veins, we concluded that they are mostly determined by errors in diagnosis and by inappropriate indications for surgery, due to incomplete clinical and imagistic examination.

Omission to identify an incompetent perforating vein leads to omission in interruption of venous reflux, followed by relapse and aggravation of skin lesions. Deficiency in examination can lead to abusive surgical procedures in areas without insufficient perforating veins.

Conclusions

In order for a perforating vein to be considered insufficient, we need to confirm the pathological reflux at the level of a dilated perforating vein.

The presence of insufficient perforating veins is more common in patients with post-thrombotic syndrome (84,84%), and less common in patients with primary varicose disease (15,16%).

The diagnosis of insufficient perforating veins is relies on clinical criteria, phlebographical and ultrasound criteria. Nowadays Doppler ultrasound examination is the main investigation used to explore the incompetence of perforating veins; the preoperative ultrasound mapping of the venous system proves to be very useful for the surgeon.

Mistakes in diagnosis of incompetent perforating veins lead to relapse or abusive surgery with severe morphological and hemodynamic consequences.

References:
5. Ignat,P., Avram,J., Bota,N,... - Chirurgia sistemului venos al membrelor inferioare, Editura Academiei, București, 1985