Nomenclature of the veins of the lower limb: Extensions, refinements, and clinical application

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The relative deficiency of the official Terminologia Anatomica with regard to the veins of the lower limbs was responsible for a nonuniform anatomic nomenclature in the clinical literature. In 2001, an International Interdisciplinary Committee updated and refined the official Terminologia Anatomica regarding the veins of the lower limbs. Recommendations for terminology were included in an updating document that appeared in the Journal of Vascular Surgery (2002;36:416-22). To enhance further the use of a common scientific language, the committee worked on the present document, which includes (1) extensions and refinements regarding the veins of the lower limbs; (2) the nomenclature of the venous system of the pelvis; (3) the use of eponyms; and (4) the use of terms and adjectives of particular importance in clinical vascular anatomy. (J Vasc Surg 2005;41:719-24.)

In 2001, an International Interdisciplinary Committee was designated by the presidents of the International Union of Phlebology (IUP), Professor H. Partsch, and of the International Federation of Anatomical Association (IFAA), Professor P.M. Motta, to update the official Terminologia Anatomica, regarding the veins of the lower limbs. In fact, the relative deficiency of the official Terminologia Anatomica with regard to the veins of the lower limbs was responsible for a nonuniform anatomic nomenclature in clinical literature. This caused difficulty in the international exchange of information and even in the inappropriate treatment of venous disease.

The committee outlined a consensus document at a meeting held in Rome on September 8 and 9, 2001, on the occasion of the 14th World Congress of the IUP with the participation of members of the Federative International Committee for Anatomical Nomenclature (FICAT). The committee’s recommendations for terminology were published in the Journal of Vascular Surgery in 2002.

Since the publication of that article, the committee collected proposals, suggestions, and criticisms to refine and improve the proposed terminology and continued to work on adapting it to daily clinical practice. These were discussed in meetings of the International Union of Angiology (IUA), IUP, and the American Venous Forum.

DEEP VEINS

The nomenclature of the deep veins proposed in 2002 (Table I) was not criticized. The main terminology recommendations, such as the designation of the deep veins of the thigh as common femoral, femoral, and deep femoral, have been accepted and commended in important journals of several medical, surgical, and radiologic specialties.

SUPERFICIAL VEINS

In the consensus document of 2002, main innovations regarding the nomenclature of the superficial veins regarded (1) the subdivision of the superficial veins according to their relationships to the saphenous fascia (Fig 1); (2) the designation of the saphenous veins as great and small and, (3) the designation of nonsaphenous veins regarding their topography and path. The criticisms and suggestions the committee received were used to refine and extend the list of the superficial veins (Table II). In particular:

*The term great saphenous vein was chosen to avoid confusion when abbreviations are used. In fact, LSV, the acronym of long saphenous vein, could be easily confused with lesser saphenous vein. In addition, it was pointed out that, in many limbs, the SSV is not “short”, nor is it “lesser”. In addition, the term great saphenous vein has largely replaced the previous term of long saphenous vein. In fact, the term great saphenous was used in 45% of articles referenced by Medline during the biennium 1999 to 2000, and in 71% during the period 2003 to 2004. The term long saphenous dropped from 55% (1999 to 2000) to 29% (2003 to 2004).
The terms sapheno-femoral junction (SFJ) and sapheno-popliteal junction (SPJ) and their valves (Fig 2) have been included in the official nomenclature because they are anatomically correct, clinically appropriate, and not misleading. However, there is no agreement in the literature with regard to the anatomic extent of the SFJ and SPJ, because a clear anatomic definition is lacking. From the strict anatomic sense of the word junction, SFJ and SPJ would correspond only to the saphenous openings with the terminal valve contained in them. The role of these valves is to prevent reflux from the femoral or popliteal veins, and they can also be located a few millimeters distal to the opening (subterminal location of the terminal valve).

However, since the terms SFJ and SPJ have been introduced, they have been considered to be more extended than indicated by the anatomic concept of “junction” (Fig 1). From classic and more recent papers on the anatomy, physiology, and pathophysiology of these junctions, it can be determined that both the SFJ and the SPJ extend distally along the saphenous trunks to the penultimate preterminal valve. This valve is located 3 to 5 cm below the terminal valve—distal to the termination of the saphenous junctional tributaries—to prevent reflux from these veins into the saphenous trunk when the terminal valve is closed.

The proximal level of the SFJ and SPJ corresponds to the valve located proximal to the saphenous opening (suprasaphenic valve), because it has a pivotal role in junctional hemodynamics. The distal limit of the SFJ and SPJ has never been established, but it was proposed that it corresponds to the valve placed distal to the saphenous opening (infrasaphenic valve), whose possible hemodynamic role is still to be defined.

†We do not recommend use of the terms ostial and junctional valve, even if anatomically correct.
‡We do not recommend use of the terms subostial, preostial, prejunctional, or subterminal valve, even if anatomically correct.
The anatomic-clinical concept of SFJ and SPJ includes the terminations of the tributaries (with their own terminal valves), which join the saphenous trunks between the terminal and preterminal valves.§

Anterior accessory of the GSV. In the first document on terminology, it was stated as a general rule that “...saphenous accessories lie out of the saphenous compartment. ...and run more superficial with respect to the main trunk.” In contrast to this general rule, the anterior accessory of the GSV (AAGSV) at the upper thigh, courses deeply (superficial to the muscular fascia, like the GSV) to a hyperechoic fascia that resembles the GSV covering (Fig 3, A). However, the AAGSV can be easily identified, because it courses more anteriorly with respect to the GSV, with a path corresponding to that of the underlying femoral artery and veins.

PERFORATING VEINS

The subdivision of perforating veins proposed in 2002 (Table III) by their topography was not criticized and was even adopted a recent and complete review on the perforating veins in 2004.

PELVIC VEINS

Pelvic veins are of great clinical importance because of their role in venous thromboembolism, pelvic congestive syndromes, and primary and recurrent varicose veins of the distal trunk and lower extremities. Pelvic venous anatomy is extremely complex because of the presence of many veins and plexuses that show variable pathways, size, and connections. The terminology proposed is reported in Table IV. In particular:

- Ovarian and testicular veins (#2, 3). Accepted synonyms: gonadal veins, spermatic veins.
- Rectal plexuses and rectal veins (#11 to 16). The rectal plexus has two parts, the internal plexus (in the sub-

Table III. Nomenclature of the perforating veins

<table>
<thead>
<tr>
<th>Foot perforators</th>
<th>Medial foot PV</th>
<th>Lateral foot PV</th>
<th>Plantar foot PV</th>
<th>Medial ankle PV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ankle perforators</td>
<td>Anterior ankle PV</td>
<td>Lateral ankle PV</td>
<td>Medial leg PV</td>
<td>Parasitibial PV</td>
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<td>Posterior tibial PV (Cockett PV)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Anterior leg PV</td>
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<td>Lateral leg PV</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Posterior leg PV</td>
</tr>
</tbody>
</table>

Leg perforators

- Medial gastrocnemius PV
- Lateral gastrocnemius PV
- Intergemellar PV
- Para-Achillean PV
- Medial thigh PV
- Suprapatellar PV

Knee perforators

- Lateral knee PV
- Infrapatellar PV
- Popliteal fossa PV
- Medial thigh PV
- PV of the femoral canal
- Inguinal PV
- Anterior thigh PV
- Lateral thigh PV
- Posterior thigh PV
- Postero-medial
- Sciatic PV
- Posterolateral
- Pudendal PV
- Superior gluteal PV

Gluteal perforators

- Midgluteal PV
- Lower gluteal PV

PV, Perforating veins

§This segment of the saphenous trunk corresponds to the French term “crosse”.

mucosa) and the external (outside the muscular coat). The term hemorroidal (or haemorrhoidal) is a correct synonym for the internal plexus. The term rectal is to be preferred for the external plexus as well as for the
veins merging into it. The term hemorrhoidal for these vessels should not be used.

- Middle rectal veins (#15). The middle rectal veins do not arise from the rectal plexus but mainly from the neighboring organs (seminal vesicles, bladder, prostate, uterus, and vagina).
- Inferior gluteal veins (#18). This term should not be confused with the term sciatic vein, which is used to designate the satellite vein of the great sciatic nerve. The latter is situated between the deep veins of the lower limb and is the main root of the inferior gluteal veins.
- Perineal veins (#20, 21). This term is commonly used in clinical literature, but it lacks a clear definition. The deep perineal veins correspond to the portion of the pudendal plexus lying above the internal face of the perineum. The superficial perineal veins are the network of subcutaneous veins of the urogenital region (posterior labial or scrotal veins, drained by the GSV) and of the perianal region (drained by the hemorrhoidal plexus).
- Pudendal plexus (#29). This lies behind the symphysis pubis and is connected with the vesical and prostatic plexuses. Correct synonyms: vesico-prostatic plexus and retropubic plexus (of Santorini).
- Deep veins of the clitoris and of the penis (#22 to 25). These are tributaries to the internal pudendal vein. The correspondent superficial veins are tributaries to the GSV by way of the superficial external pudendal vein.
- Veins of the broad ligament (#33). These connect the uterine plexus with the inguinal superficial veins. They represent an important pathway for the transfer of venous hypertension from the pelvic district to the anterior abdominal wall and to the lower limb.\(^{19}\)
- Pubic veins (#39). These ascend on the back of the pubis to connect the obturator veins with the external iliac.
- Supravaginal veins (#40). These are a network of superficial veins that connect the left and right inferior epigastric veins.

**EPONYMS**

As a general rule, the use of eponyms is discouraged. In the first consensus document,\(^5\) the committee reported the only eponyms that were correct from the historical and anatomic points of view. A thorough survey of the more recent literature demonstrated that only the following eponyms and synonyms are correctly used in journals with worldwide circulation:

- Giacomini’s vein designates the medial thigh anastomosis between the SSV with the GSV. Giacomini’s vein corresponds to the posterior thigh circumflex vein, which may originate from the SSV or from its

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**Table IV. Nomenclature of the pelvic veins**

<table>
<thead>
<tr>
<th>Plexus and peripheral veins</th>
<th>Draining veins</th>
<th>Main collectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Pampiniform plexus</td>
<td>2  Ovarian veins</td>
<td>4  Inferior vena cava</td>
</tr>
<tr>
<td>5  Sacral Venous plexus</td>
<td>6  Median sacral vein</td>
<td>10 Common iliac vein</td>
</tr>
<tr>
<td>3  Testicular veins</td>
<td>7  Iliolumbar vein</td>
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</tr>
<tr>
<td>8  Internal iliac (Hypogastric)</td>
<td>9  External iliac</td>
<td></td>
</tr>
<tr>
<td>11 ● External rectal plexus</td>
<td>13 Superior rectal vein</td>
<td>14 Inferior Mesenteric vein</td>
</tr>
<tr>
<td>12 ● Internal rectal plexus</td>
<td>15 Middle rectal veins</td>
<td></td>
</tr>
<tr>
<td>20 Deep perineal veins</td>
<td>27 Internal pudendal vein</td>
<td></td>
</tr>
<tr>
<td>21 Superficial perineal veins</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22 Deep dorsal veins of clitoris</td>
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<td></td>
</tr>
<tr>
<td>23 Deep veins of clitoris</td>
<td>37 Vaginal veins</td>
<td></td>
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<tr>
<td>24 Deep dorsal veins of penis</td>
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<td></td>
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<tr>
<td>25 Deep veins of penis</td>
<td>38 Ophthalmic veins</td>
<td></td>
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<tr>
<td>26 Urethral bulb veins</td>
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<td></td>
</tr>
<tr>
<td>29 Pudendal plexus</td>
<td></td>
<td>38 Internal iliac vein (hypogastric)</td>
</tr>
<tr>
<td>30 ● Vesical plexus</td>
<td>35 Vesical veins</td>
<td></td>
</tr>
<tr>
<td>31 ● Prostatic plexus</td>
<td>36 Uterine veins</td>
<td></td>
</tr>
<tr>
<td>32 Uterine plexus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33 Vein of the broad ligament</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34 Vaginal plexus</td>
<td>39 Pubic veins (accessory obturator veins)</td>
<td></td>
</tr>
<tr>
<td>35 Vesical veins</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36 Uterine veins</td>
<td></td>
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</tr>
<tr>
<td>37 Vaginal veins</td>
<td></td>
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<tr>
<td>38 Ophthalmic veins</td>
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<td></td>
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<tr>
<td>39 Pubic veins</td>
<td></td>
<td></td>
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<tr>
<td>40 Supravaginal veins</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41 Superior epigastric vein</td>
<td></td>
<td></td>
</tr>
<tr>
<td>42 Deep circumflex iliac vein</td>
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</tbody>
</table>
thigh extension and ends in the GSV or its posterior accessory.

- **Posterior arch vein** designates the vein that lies on the medial surface of the leg, posterior and parallel to the GSV. It corresponds to the leg portion of the posterior accessory of the GSV.

- **Cockett’s perforating veins** correspond to the posterior tibial perforators that connect the posterior arch vein with the posterior tibial veins.

- **Santorini’s plexus** is an extremely popular term and commonly used by urologists to indicate the retro-pubic vesico-prostatic plexus.

**GENERAL TERMINOLOGY**

The calibers of the veins of the lower limbs show a great interindividual variability. In addition, developmental abnormalities may cause segmental intraindividual variations. The terminology used to indicate caliber variations of veins is not uniform because of the subtle differences in interpretation of the correct terms and adjectives that are used to describe different degrees of development of an organ. According to main medical dictionaries:

- **Agenesis** indicates the complete absence of a vein or of a segment of a vein.

- **Aplasia** indicates the lack of development of a vein or of a segment of a vein. The vein is present but diminutive in size and its structure is similar to that in the embryo.

- **Hypoplasia** indicates the incomplete development of a vein or of a segment of a vein. It is less severe in degree than aplasia, and the hypoplastic vein has a reduced caliber with a normal structure (Fig 3, B).

In daily clinical practice, these terms could be pragmatically used on the basis of duplex findings. The absence of a vein or of a segment of a vein at routine duplex scanning (8- to 10-MHz probes for superficial veins, 3.5- to 5-MHz probe for deep veins) indicates aplasia, whereas a caliber <50% of normal values indicates hypoplasia.

- **Dysplasia** indicates a complex abnormality of development of a vein or of a group of veins that greatly differs from the normal conditions in size, structure, and connections.

- **Atrophy** indicates a decrease in size or wasting away of a normally developed vein or segment of a vein, following a degenerative process. Wall changes are different, according to the nature of the degenerative process.

- **Venous aneurysm** indicates a localized dilation of a venous segment, with a caliber increase >50% compared with normal.

- **Venomegalia** designates diffuse dilation of one or more veins with a caliber increase >50% compared with normal.

**Adjectives distal and proximal.** These adjectives are not uniformly used in the clinical literature when referred to venous structures. A thorough review of the current literature on venous medicine and surgery indicates that **distal** is actually used to indicate the part of the vein away from the heart, whereas **proximal** is towards the heart.

**The correct meaning of the term double.** Real anatomic doubling of a vein occurs only when the two veins show the same path, topography, and relationships, such as the tibial or peroneal veins (Figs 3, C and D). When one or more vessels course parallel with respect to the main vein...
but in different planes or compartments of the limb (Fig 1, A), the main vein cannot be considered double but only functionally duplicated, such as the femoral vein and an axial transformation of the deep femoral vein.22

CONCLUSION

Anatomic terminology is the foundation of medical communication. Effective exchange of information is possible only if a common terminology is used. The nomenclature proposed in 2002 by the International Interdisciplinary Committee,3 has now been extended and further refined, taking into account recent improvements in the knowledge of venous clinical, radiologic, and surgical anatomy. This report represents the final summation of this committee’s work. Adoption of the present terminology recommendations will contribute to making the language more uniform, the diagnosis more accurate and the treatment of venous disorders more correct.

REFERENCES

5. Caggiati A. The femoral vein is not superficial—not is the saphenous vein. Radiology Online, 3 Dec 2003. Available at http://radiology.rsnaorphs.org/cgi/eletters/229/2/604