INFORMATION ON THE CHANGES IN THE REVISED ANATOMICAL NOMENCLATURE OF THE LOWER LIMB VEINS

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Background. Two consensus documents have appeared which revised the anatomical nomenclature of the venous system of the lower extremity. They changed and substantially extended the last valid version of the Latin anatomical nomenclature, *Terminologia Anatomica*, published by the Federative Committee on Anatomical Terminology, with approval of the International Federation of Associations of Anatomists, in 1998. The clinicians felt the need to adjust the terminology in order to better serve their purposes and to serve as a relevant theoretical base for correct diagnostic and appropriate treatment. First a consensus was made to expand and complete the nomenclature of the lower limb venous system during the 14th World Congress of the International Union of Phlebology in 2001. Another consensus was made again three years later, during 21st World Congress of the International Union of Angiology, under the auspices of Federative Committee on Anatomical Terminology and International Federation of Associations of Anatomists.

Methods and results. The articles were compiled with the emphasis on the Latin terminology. Review of the original articles concerning the arrangement, variability and different nomenclature was performed thoroughly. The both documents comprise 89 terms of the veins of the lower extremity in both Latin and English.

Conclusion. The clinicians, anatomists, and university teachers should follow the new extended anatomical nomenclature of the lower limb veins. The precise anatomical terminology can serve for diagnostic, treatment, and scientific purposes not only in the anatomy and angiology.

INTRODUCTION

Terminology is the most important and necessary tool of all the medical fields to enable the exact description and clear communication without ambiguity. The importance is not only in specific fields, but in medicine as a whole and even beyond its borders. The development of anatomy began two and half thousand years ago in the ancient world. Its terminology is based on the classical languages. It is of principle to distinguish between terminology (set of specialized terms) and nomenclature (set of standardized terms arranged following certain classification principles). The nomenclature in anatomy (in Latin) is standardized and approved for more than one hundred years.

The society of German-speaking anatomists (Anatomische Gesellschaft) created the first Latin anatomical nomenclature, approved in 1895 in Basel (Switzerland) and named the *Basiliensia Nomina Anatomica*. Then sev-

eral further revisions were issued (*Birmingham Revision* in 1933, *Jenaisia Nomina Anatomica* in 1935, first official international anatomical terminology accepted worldwide – *Parisiensia Nomina Anatomica* in 1955, and its 2nd to 6th edition (Nomina Anatomica) in years 1960–1989. The Federative Committee on Anatomical Terminology (FCAT; later changed to Federative International Committee on Anatomical Terminology – FICAT) was elected in Rio de Janeiro (Brasil) in 1989 and it published a new, extended and revised proposal of the Latin anatomical terminology in 1998 as the *Terminologia Anatomica*, with the subtitle *International Anatomical Terminology (TA)*^{1–3}.

The nomenclature of the lower limbs veins was extended in 2001. At the congress held in Rome in 2001, the International Interdisciplinary Committee (IIC) was appointed by the International Union of Phlebology (IUP), the International Federation of Associations of Anatomists (IFAA), and the Federative International Committee on Anatomical Terminology (FICAT) due to the needs of the anatomists and phlebologists involved in the investigation and treatment of venous diseases⁴. The commission issued a consensus document, later published as “Nomenclature of the veins of the lower limbs: an international interdisciplinary consensus statement” (ref.⁵). Three years later, a second consensus document was pub-

ABBREVIATION

CEAP – Classification and grading of chronic venous disease in the lower limb

lished, focuses on the veins of pelvis and other clinical terms concerning veins of the lower extremity. It was published as „International Interdisciplinary Consensus Committee on Venous Anatomical Terminology: Nomenclature of the veins of the lower limb: extensions, refinements, and clinical application“ (ref.⁶).

RESULTS

The veins of the lower limb belong to the most variable systems in the human body. In spite of such vast variability, it is still possible to trace certain system of the veins arrangement. The veins of the lower extremity can be divided into three systems: superficial, deep, and their mutual interconnections (perforating veins). These systems are situated in different compartments. The deep veins are doubled from periphery as proximal as the *vena poplitea*. Finally, all the blood is collected to *vena iliaca externa* and then to *vena cava inferior*.

New compartment

A new compartment was defined thanks to the development of ultrasound examination. This narrow space is located in the superficial compartment, bordered deeply with muscular fascia and superficially with „fascia saphena“ (a hyperechogenic structure visible in the ultrasound image). Anatomically this space is called *compartimentum saphenum* (saphenous compartment). „Fascia saphena“ is a part of the *stratum membranosum telae subcutaneae* (membranous layer of subcutaneous tissue)

covering the proper *venae saphenae* and their beginnings, i.e. *venae marginales medialis et lateralis* and *rete venosum dorsale pedis*. All other synonyms are misleading and are considered as obsolete: „fascia superficialis; subcutaneous pseudofascia; superficial layer of the deep fascia; Colles' fascia; Scarpa's fascia etc.“ (ref.^{1,7}). Unfortunately applying the word *fascia* in the term „fascia saphena“ is misleading due to its structure, which is totally different from a general structure of any fascia^{2,3,8}. Clinically, in patients undergoing radiofrequency ablation or endovenous laser therapy, a fluid with anesthetic is applied under ultrasound control into the *compartimentum saphenum* to reduce the postoperative pain⁸.

Small vessels and CEAP

Concerning the lumen and the depth of the venous vessels, several distinct categories can be classified. Venules are gathered into *plexus venosus subpapillaris* (*superficialis et profundus*), situated in the dermis and reaching to dermal papillae. These plexuses are drained into the *plexus venosus dermalis profundus*, extending in the reticular layer of the dermis. Then the blood flows into the *plexus venosus subcutaneus*, located in the hypodermis and further into superficial veins.

The CEAP classification includes several terms related to previous structures: teleangiectasia and reticular veins (P1) belong to the dermal venous plexus, saphenous veins (P2–4) and non-saphenous varicose veins (P5) to subcutaneous plexus, and finally deep (P11–15), pelvic (P10) and muscular (P16) to subfascial veins⁹.

Fig. 1. Veins of the lower limb – ventral aspect.

Fig. 2. Veins of the lower limb – dorsolateral aspect.

As for the wall structure of the superficial veins of the lower limb, and its changes, especially aimed to changes of collagen and elastin fibers content, see details in Haviarová et al.¹⁰.

Changes of nomenclature: deep veins

Terms of several veins were changed and differ from those listed in TA, some other terms of anatomically and mainly clinically important veins were added¹¹.

Vena femoralis communis (common femoral vein) is a newly defined term, identifying the short segment of the vena femoralis, proximal to its confluence with the *vena profunda femoris* and covering the rest of the vessel as high as *ligamentum inguinale*. The often used term “vena femoralis superficialis”, which has never been a part of any nomenclature, should be omitted and the vein, stretching from the *hiatus adductorius* to the confluence with the *vena profunda femoris* is designated as the *vena femoralis* (see Fig. 1 and 2).

Fig. 3. Ultrasound image of the vena saphena parva in the proximal leg.

FS – fascia saphena, FC – fascia cruris, MG – musculus gastrocnemius, * – compartimentum saphenum, x – vena saphena parva

Legend to figures 1, 2, 4

AVDP – arcus venosus dorsalis pedis, CVS – confluens venosus subinguinalis, ECVSP – extensio cranialis venae saphenae parvae, VCFA – vena circumflexa femoris anterior, VCFP – vena circumflexa femoris posterior, VCIS – vena circumflexa ilium superficialis, VIC – vena iliaca communis, VIE – vena iliaca externa, VII – vena iliaca interna, VIs – vena intersaphena, VES – vena epigastrica superficialis, VF – vena femoralis, VFC – vena femoralis communis, vG – „vena Giacomini“, VP – vena poplitea, VPEP – vena pudenda externa profunda, VPES – vena pudenda externa superficialis, VPF – vena profunda femoris, VSM – vena saphena magna, VSMMAA – vena saphena magna accessoria anterior, VSMAP – vena saphena magna accessoria posterior, VSP – vena saphena parva, VMM – vena marginalis medialis, VML – vena marginalis lateralis, VvPf – venae perforantes

Changes of nomenclature: vena saphena magna

All synonyms for the *vena saphena magna* (great saphenous vein) are considered obsolete: “long saphenous vein; greater saphenous vein; internal saphenous vein; la veine saphène interne”.

A new term describing the estuary of the *vena saphena magna* into the *vena femoralis communis*, was introduced – *junctio saphenofemoralis* (saphenofemoral junction). It is a subsidiary term to another newly added one: *confluens venosus subinguinalis* (confluence of superficial inguinal veins). It replaced all the clinically used unprecise synonyms: “subinguinal venous star; venous star of Paturet; Crosse; saphenofemoral complex; Venenstern unter dem Leistenband; Cockett venous star” (see Fig. 3).

Four venous valves gained official terms: *valvula terminalis* (terminal valve; obsolete terms – “ostial valve;

Fig. 4. Native preparation of the confluens venosus subinguinalis.

junctional valve”) at the very end of the *vena saphena magna*, present in 94–100% of cases; and *valvula preterminalis* (preterminal valve; obsolete terms – “subostial valve; preostial valve; prejunctional valve; subterminal valve”), 3–5 cm distal from the end of the vein¹². Two other valves of the same names are present in the distal segment of the *vena saphena parva*.

The tributaries of the *vena saphena magna*, located superficially to the *compartimentum saphenum*, were called:

- *vena circumflexa femoris anterior* (anterior thigh circumflex vein) – obsolete synonyms: “lateral accessory saphenous vein; anterolateral (superficial) vein of the thigh; anterior lateral tributary; anterior femoral cutaneous vein; vena semicircularia anterior; ramus descendens lateralis anterior”.
- *vena circumflexa femoris posterior* (posterior thigh circumflex vein) – obsolete synonyms: “medial accessory saphenous vein; posteromedial (superficial) vein of the thigh; posteromedial thigh vein; posterior medial tributary; large accessory saphenous vein; Cruveilhier’s vein; cutaneo-femoral superficial internal vein; vena semicircularia posterior; ramus descendens lateralis posterior”.
- *vena saphena magna accessoria anterior* (anterior accessory of great saphenous vein) – obsolete synonyms: “pre-saphenous arch vein (in thigh); anterior saphenous vein of leg; anterior superficial tibial vein; vena arcuata cruris anterior; anterior tributary vein; anterior calf vein (in leg)”.
- *vena saphena magna accessoria posterior* (posterior accessory of great saphenous vein) – obsolete synonyms: “post-saphenous arch vein (in thigh); posterior leg vein; vena arcuata cruris posterior (in leg) – its leg segment corresponds to the “vena Leonardi”.
- *vena saphena magna accessoria superficialis* (superficial accessory of great saphenous vein)

Changes of nomenclature: vena saphena parva

The estuary of the *vena saphena parva* (small saphenous vein) – obsolete synonyms: “short saphenous vein; external saphenous vein; lesser saphenous vein; little saphenous vein; peroneo-malleolar vein; la veine saphène” – was entitled the *junctio saphenopoplitea* (saphenopopliteal junction), with two valves (see above). The vein lies in the above mentioned *compartimentum saphenum* (Fig. 4). A special continuation of the *vena saphena parva* axis is now called the *extensio cranialis venae saphenae parvae* (cranial extension of small saphenous vein; obsolete terms – “vena femoropoplitea; vena subcutanea femoris; vena subaponeurotica; femoropopliteal vein; thigh extension of small saphenous vein; dorsal extension of small saphenous vein; post-axial extension of small saphenous vein; posterior cutaneous vein (of femur); vein of small ischiatic nerve; la veine sous-aponéurotique postérieure de la cuisse”) is present in 95% of cases¹³. If it is connected to the *vena circumflexa femoris posterior* (53% of cases) this proximal segment is called “vena Giacomini” and belongs to the *venae intersaphenae*^{14–16}. *Vena saphena parva* can be superficially accompanied with the *vena saphena*

parva accessoria superficialis (superficial accessory small saphenous vein) in the distal part of the leg.

The interconnections between the trunks of the *vena saphena magna et parva* are known as *venae intersaphenae* (intersaphenous veins).

Changes of nomenclature: other veins of the lower limb

A clinically important venous network situated on the lateral side of the leg and thigh is now termed the *systema venosum laterale membri inferioris* (lateral venous system; obsolete terms – “lateral thigh vein; lateral subdermic (venous) system; Albanese vein; Albanese venous system”).

The term “*venae surales*” (sural veins) was omitted and replaced with more specific *venae soleales* (soleal veins), *vena medialis et lateralis gastrocnemii* (medial and lateral gastrocnemius vein) and *vena intergemellaris* (intergemellar vein) as well as the term “*venae geniculares*” (genicular veins) was abandoned and substituted with more precise *plexus venosus genicularis* (genicular venous plexus).

To distinguish between *venae perforantes*, communication between the superficial and deep venous system of the lower limb (see below), and the veins accompanying the *arteriae perforantes*, branches from the *arteria profunda femoris*, the latter were declared as *venae comitantes arteriarum perforantium* (deep femoral communicating veins).

Vena ischiadica (sciatic vein) is a term applied to a persistent vein after the embryonic *vena axialis*.

Changes of nomenclature: veins in the pelvis

Venae suprapubicae (suprapubic veins) describes a system of smaller veins in the pubic region, connecting the networks of the left and right *vena epigastrica inferior* whilst one or more *venae pubicae* (pubic veins) are situated between the *vena epigastrica inferior* and *vena obturatoria*, running across the *ramus superior ossis pubis* and forming the venous “corona mortis Hesselbachii”. This poses a danger in the operations of femoral hernias.

As for the pelvic plexuses, the rectal blood circulation was specified: *plexus venosus rectalis externus* is situated in the adventitia and *plexus venosus rectalis internus* extends in the *tela submucosa* and is also called the *plexus haemorrhoidalis*.

Plexus pudendus (pudendal plexus; obsolete terms – “vesico-prostatic plexus; retropubic plexus; plexus of Santorini”) is a network behind the lower part of the *symphysis pubica* and in front of the prostate and urinary bladder in the *spatium retropubicum* (Retzius’ space).

Venae ligamenti lati uteri is the new term for fine veins along the *ligamentum teres uteri* connecting *plexus venosus uterinus* and *vena saphena magna*.

Venae perineales (perineal veins) is a clinical term concerning the veins in the superficial region of the perineum.

Changes of nomenclature: *venae perforantes*

The *venae perforantes* (perforating veins; synonyms – perforators; perforating vessels; perforating tributaries) represents a separate chapter which is defined as veins piercing the muscular fascia to connect the superficial and deep venous system of the lower extremity. A formerly used synonym the *venae communicantes* (communicating veins) is restricted to vessels connecting veins of the same system (e.g. *venae intersaphenae*).

There are approximately 95–155 *venae perforantes*, but only about 40 of these are consistently present¹⁷.

They were classified into six groups according to their topographical position – perforators of foot, ankle, leg, knee, thigh, and gluteal region:

- *venae perforantes pedis dorsales, mediales, laterales, plantares* (foot perforators)
- *venae perforantes tarsales seu malleolares mediales, anteriores, laterales* (ankle perforators)
- *venae perforantes mediales, anteriores, laterales, posteriores cruris* (leg perforators), corresponding to the former Sherman's perforators (*vena perforans cruris paratibialis inferior et media*), Boyd's perforator (*vena perforans cruris paratibialis superior*), three Cockett's perforators (*vena perforans cruris tibialis posterior superior, media et inferior*)
- *venae perforantes genus mediales, suprapatellares, laterales, popliteales* (knee perforators)
- *venae perforantes femoris mediales, anteriores, laterales et posteriores* (thigh perforators), including *venae perforantes canalis adductorii* (perforators of femoral canal) corresponding to the Dodd's perforator
- *venae perforantes femoris venae perforantes gluteales superiores, mediae et inferiores* (perforators of gluteal muscles).

Eponyms

Eponymic terms are common, especially among the clinicians. IIC recommended the use of only three eponyms in clinical practice (no eponyms are recommended in the anatomical texts by FCAT), i.e. Cockett's perforators for the *venae perforantes cruris posteriores tibiales*, Santorini's plexus for the *plexus pudendus*, and Giacomini's vein for one of the *venae intersaphenae*, referring to a segment connecting the *extensio cranialis venae saphenae parvae* to the *vena circumflexa femoris posterior*.

For further details, see <http://www.phlebologia.com/en/main.asp>⁴.

CONCLUSION

Clear, simple, and precise anatomical terminology which was presented above, is a necessary base for the clear and understandable language in angiology and phlebology. This is reflected in the exact and comprehensive description of the venous system of the lower extremity for easy diagnosis and corresponding treatment of venous diseases. The worldwide use and officially accepted norm of nomenclature enables communication and discussion among specialist of all languages and geographical areas.

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