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ANTERIOR GREAT SAPHENOUS VEIN: CASE REPORT

VEIA SAFENA MAGNA ANTERIOR: RELATO DE CASO

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Rafaela Barros dos Santos[1], Caty Esbelana Urrego Ditta[2], Rebeca Caranha Araujo[3], Kimberlly Menslin Pimenta[4], Thiago Pinto de Melo[5], Natan Caiado Nascimento Silva[6], Camilly Natalia Moreira Almeida[7], Leandro Araújo de Souza[8], Elias Gomes Freitas[9], Jonathan Sales Diez[10], Natália Cristina da Costa Vieira[11], Maria Clara Torres Miranda[12], Paulo Rodrigues dos Santos Junior[13], Rebeca Carolina Lira de Carvalho Otero[14], Victor Rodrigo Félix dos Santos[15]

ABSTRACT

Knowledge of anatomical variations in the superficial venous drainage of the lower limb is essential for both clinical and surgical practice. In this case study, duplication of the great saphenous vein (GSV) was identified in the right leg of a male cadaver during routine dissection at the Human Anatomy Laboratory of the State University of Amazonas. Classically, the GSV originates from the union of the dorsal venous arch of the foot with the medial dorsal digital vein of the hallux. However, the venous system of the lower limb is complex and subject to significant variability. Recognizing such variants, including congenital malformations, is crucial to avoid diagnostic errors and surgical complications. Although the GSV frequently receives tributaries along its course and anastomoses with the small saphenous vein, reports of true duplication remain scarce. Further investigation is needed to clarify its morphology and clinical implications.

Keywords: Lower Limb. Dissection. Great Saphenous Vein. Anatomical Variation.

RESUMO

O conhecimento das variações anatômicas na drenagem venosa superficial do membro inferior é essencial tanto para a prática clínica quanto cirúrgica. Neste estudo de caso, foi identificada a duplicação da veia safena magna (VSM) na perna direita de um cadáver

[1] Medical Student. Faculdade Santa Teresa. E-mail: rafab@gmail.com
[2] Medical Student. Faculdade Santa Teresa. E-mail: catyes@gmail.com
[3] Nurse. Faculdade Santa Teresa. E-mail: recaara@gmail.com
[4] Medical Doctor. UAP. E-mail: kimmenslin@gmail.com
[5] Medical Student. FAMETRO. E-mail: thiagopintodemelomed@gmail.com
[6] Medical Student. FAMETRO. E-mail: natancaiadoo@gmail.com
[7] Medical Student. FAMETRO. E-mail: camillynatalia@yahoo.com.br
[8] Medical Student. FAMETRO. E-mail: leoaraujosouza10@gmail.com
[9] Medical Student. FAMETRO. E-mail: freitas.gomes3009@gmail.com
[10] Medical Student. FAMETRO. E-mail: johnsalesd@gmail.com
[11] Medical Student. FAMETRO. E-mail: ncvieira6@gmail.com
[12] Medical Student. FAMETRO. E-mail: mmclaratorres@gmail.com
[13] Medical Student. UNL. E-mail: fleumer@gmail.com
[14] Medical Student. UEA. E-mail: rebecalira@gmail.com
[15] Medical Student. UEA.

Revista ARACÊ
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masculino durante uma dissecação rotineira no Laboratório de Anatomia Humana da Universidade do Estado do Amazonas. Classicamente, a VSM origina-se da união do arco venoso dorsal do pé com a veia digital dorsal medial do hálux. No entanto, o sistema venoso do membro inferior é complexo e sujeito a significativa variabilidade. Reconhecer tais variantes, incluindo malformações congênitas, é fundamental para evitar erros diagnósticos e complicações cirúrgicas. Embora a VSM frequentemente receba tributárias ao longo de seu trajeto e apresente anastomoses com a veia safena parva, relatos de verdadeira duplicação permanecem escassos. Investigações adicionais são necessárias para esclarecer sua morfologia e implicações clínicas.

Palavras-chave: Membro Inferior. Dissecação. Veia Safena Magna. Variação Anatômica.

RESUMEN
El conocimiento de las variaciones anatómicas en el drenaje venoso superficial del miembro inferior es esencial tanto para la práctica clínica como quirúrgica. En este estudio de caso, se identificó la duplicación de la vena safena magna (VSM) en la pierna derecha de un cadáver masculino durante una disección rutinaria en el Laboratorio de Anatomía Humana de la Universidad del Estado de Amazonas. Clásicamente, la VSM se origina de la unión del arco venoso dorsal del pie con la vena digital dorsal medial del hallux. Sin embargo, el sistema venoso del miembro inferior es complejo y está sujeto a una variabilidad significativa. Reconocer estas variantes, incluidas las malformaciones congénitas, es fundamental para evitar errores diagnósticos y complicaciones quirúrgicas. Aunque la VSM recibe con frecuencia tributarias a lo largo de su trayecto y presenta anastomosis con la vena safena menor, los reportes de duplicación verdadera siguen siendo escasos. Se necesita mayor investigación para esclarecer su morfología y sus implicaciones clínicas.

Palabras clave: Miembro Inferior. Disección. Vena Safena Magna. Variación Anatómica.

Revista ARACÊ
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1 INTRODUCTION

The great saphenous vein (GSV) originates on the medial side of the foot as a continuation of the medial portion of the dorsal venous arch. It ascends anterior to the medial malleolus and travels along the medial aspect of the leg, accompanied by the saphenous nerve. At the knee, it becomes more superficial before continuing along the medial thigh. Within the thigh's medial compartment, it perforates the cribriform fascia at the saphenous hiatus to drain into the femoral vein. The GSV typically contains 10–20 valves and establishes multiple communications with the deep venous system (STANDRING et al., 2005).

The concept of the saphenous compartment was first described by Caggiati (1997), demonstrating that the GSV runs within a well-defined fascial compartment, bordered superficially by the saphenous fascia and deeply by the muscular fascia. This redefined its classification as a true truncal vein, distinct from its tributaries. In 2001, the International Union of Phlebology, the International Federation of Associations of Anatomists, and the Federative International Programme on Anatomical Terminology formalized this distinction between the GSV and the small saphenous vein (SSV).

Despite these advances, variations of the GSV remain underreported. The venous anatomy of the lower limb demonstrates greater variability than its arterial counterpart, particularly in the proximal portion of the GSV. Such variations are clinically significant, as they may mimic tributaries, lead to misinterpretation in imaging, or result in complications during surgical interventions (ANASTASIA, 2020).

Primitive vascular channels in the developing limbs first appear during the third week of gestation. In the initial phase of this process the indifferent stage the vasculature consists solely of a primitive capillary network. The subsequent retiform stage is characterized by the emergence of larger plexiform structures. By the third week, the system enters the maturation stage, during which more substantial vascular channels form and arterial, venous, and lymphatic vessels begin to acquire their definitive structural features (UHL, 2010). An important consideration is that the spatial arrangement of blood vessels mirrors the organization of the peripheral neural network. Nerves form first, and both their axons and the surrounding Schwann cells release vascular endothelial growth factor (VEGF). This molecule appears to play a dual role: it directs primitive vascular channels toward developing nerves and subsequently promotes their differentiation into arterial, venous, or lymphatic pathways (UHL, 2010).

Revista ARACÊ
ISSN: 2358-2472

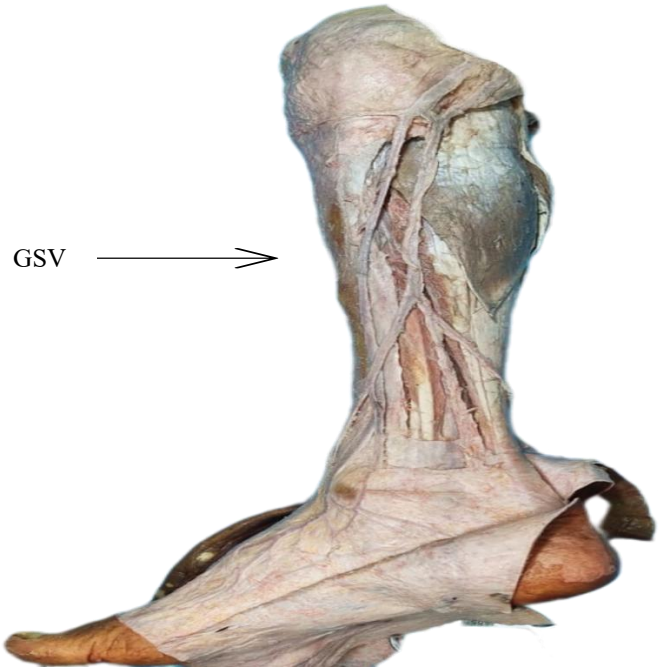
This case report describes a unilateral duplication of the anterior great saphenous vein in the right leg, highlighting its morphological features and clinical importance.

2 CASE REPORT

During the dissection of the lower limb of an adult male cadaver, belonging to the Human Anatomy Laboratory of the State University of Amazonas, a unilateral duplication of the GSV was observed in the right leg. Following meticulous removal of the skin and subcutaneous tissue, two parallel venous trunks were identified within the saphenous compartment (Figure 1).

Figure 1

Anatomical dissection of the right leg showing the saphenous compartment. Medial view of the right leg. GSV = great saphenous vein; AGSV = anterior great saphenous vein.



In the specimen, the GSV originated in its classical fashion from the union of the medial dorsal digital vein of the hallux with the dorsal venous arch. Instead of ascending as a single trunk, however, the vein duplicated in the lower third of the leg. The duplicated vein crossed over the main GSV and both ascended medially towards the knee. In the upper third of the leg, an anastomosis was observed between the two venous trunks, after which only a single

Revista ARACÊ
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vein continued proximally. The duplicated anterior GSV measured approximately 44 cm in length, with a variable diameter of 4–6 mm.

3 DISCUSSION

The great saphenous vein is the main superficial vein of the lower limb, representing its preaxial vein. It originates from the medial marginal vein of the foot and ascends anterior to the medial malleolus. From there, it courses obliquely across the lower medial surface of the tibia, following its border up to the level of the knee. Continuing along the medial aspect of the thigh, the GSV traverses the saphenous hiatus and drains into the femoral vein below the inguinal ligament. The GSV is the longest superficial vein in the human body and plays a major role in venous return of the lower limb. Its anatomical variations, although relatively uncommon, are clinically significant. True duplication occurs when two saphenous veins course in parallel within the same fascial compartment (OĞUZKURT, 2012). In contrast, accessory saphenous veins lie outside this compartment, following a distinct trajectory, and should not be mistaken for duplications.

The prevalence of true GSV duplication is reported to be approximately 1% of the population (OĞUZKURT, 2012), making this finding rare. Pasotti et al. (2022) documented a case of nearly complete duplication along the entire course of the GSV. Such variants are not only of academic interest but may also have implications in vascular surgery, phlebology, and diagnostic imaging.

Five distinct anatomical configurations of the great saphenous vein (GSV) have been documented in the thigh (CHEN, 2009). The characteristic morphology of the saphenous compartment often described as resembling an “Egyptian eye” serves as a reliable landmark for recognizing and discriminating these patterns, summarized as follows:

Pattern 1: A single GSV coursing within the saphenous compartment, with no major parallel tributaries observed (Fig. 1).

Pattern 2: A solitary GSV located in the saphenous compartment accompanied by a prominent subcutaneous tributary. This tributary pierces the superficial fascia and joins the GSV at variable levels along the thigh (Fig. 2).

Pattern 3: A variation of the previous arrangement, characterized by a proximally positioned GSV within the saphenous compartment and a substantial subcutaneous tributary located distally. No additional significant venous structures are visible within the

Revista ARACÊ
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compartment. The tributary again perforates the saphenous fascia at different thigh levels before merging with the GSV.

Pattern 4: The GSV is accompanied by the anterior accessory saphenous vein, which runs along the lateral aspect of the thigh. Although initially situated in separate distal saphenous compartments, the two veins converge into a single compartment before entering the saphenofemoral junction (Figs. 3a and 3b).

Pattern 5: A rare anatomical variant consisting of GSV duplication, reported in approximately 1% of individuals. Two criteria define this variant: both GSVs must lie in the same plane, parallel to the skin and overlying the deep aponeurotic fascia; and they must exhibit equivalent calibers while draining a shared cutaneous territory. An accessory saphenous vein is frequently mistaken for a duplicated GSV, yet it is typically smaller and does not drain the same skin territory. GSV duplication may be classified into three subtypes according to its spatial relationship with the femoral vein.

Clinically, the GSV is frequently implicated in varicose vein disease, which affects up to one-third of the adult population (SEIDEL et al., 2017). Anatomical variations may influence hemodynamic patterns, contribute to venous insufficiency, or complicate surgical outcomes. Duplicated veins may serve as residual sources of reflux after interventions, potentially leading to recurrence of varicosities (MESHRAM et al., 2018).

From a surgical standpoint, the GSV is a common conduit for coronary artery bypass grafting and peripheral vascular reconstruction (PASOTTI et al., 2023). Recognition of anatomical duplications is therefore critical for preserving adequate autologous graft material and ensuring optimal surgical planning.

In summary, identifying and reporting rare variations such as GSV duplication enhances the understanding of venous anatomy and provides valuable insights for clinical and surgical practice.

4 CONCLUSION

The great saphenous vein is a major superficial vein of the lower limb, characterized by multiple tributaries and communications with the deep venous system. Anatomical variations, such as duplication, though rare, carry important clinical implications. Awareness of these variations is essential for accurate diagnosis, surgical planning, and prevention of complications in procedures involving the venous system. Preoperative evaluation using

Revista ARACÊ
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imaging techniques should always consider the possibility of venous duplication to improve outcomes and reduce recurrence rates in venous interventions.

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Revista ARACÊ
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