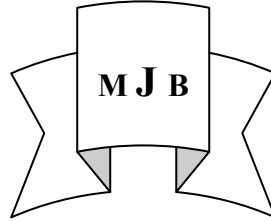


The Incidence of Double Great Saphenous Vein Among Iraqi People: Case Series Study

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Abstract

The study included dissection of the lower limbs of 10 cadavers to rule out the gross anatomy of the great saphenous vein together with any possible anatomical variations.

The vein aroused anatomically as a continuation of the dorsal venous arch at proximal part of the metatarsal bones in 14 limbs (70%) and in the rest 6 limbs (30%); it started as a continuation of the first common metatarsal vein on the medial side of the big toe and received communications from the dorsal digital veins.

The great saphenous vein was found to be duplicated in 4 limbs (20%), of these, 2 limbs (10%) below the knee and 2 limbs (10%) above the knee. Both the main vein and the accessory vein joined their own perforators.

الخلاصة

تضمن البحث دراسة عن التشريح الطوبوغرافي للوريد الصافن الكبير في الأطراف السفلى للإنسان وقد اجري هذا البحث من خلال إجراء التشريح التفصيلي على عشر جثث ثمانية منها ذكور واثنان منها إناث وقد تمت عملية التحنيط في قسم التشريح كلية الطب جامعة النهرين وكلية طب بابل باستخدام المحلول المحور وهو المحلول المستخدم في أعمال الحفظ والتحنيط والمكون من الكحول الأيثلي ٨% و الفورمالين ٤٠% والكسيرين ٦% و الفينول ٢% والماء ٦٨% حيث تم إجراء التشريح المتكامل وتبين من خلال هذا إن:

- أ- الوريد الصافن الكبير هو جزء من الشبكة الوريدية السطحي للطرف السفلي للإنسان مع وجود روافد وريدية تصب فيه.
 - ب- بتواجد الوريد الصافن الكبير بين الجلد والطبقة الليفية المحيطة بالعضلات ضمن الطبقة السطحية الليفية للطرف السفلي.
 - ج- يصب الوريد الصافن الكبير في منطقة المغين في الوريد الفخذي وتكون نقطة الالتقاء محمية يمام ثنائي الطية يسمح بمرور الدم نحو الأوردة الداخلية ويمنع رجوعها بالاتجاه المعاكس.
- من خلال الملاحظات التشريحية يتبين انه:-

- ١- الوريد الصافن الكبير هو احد الأوردة المكونة للشبكة الوريدية السطحية للساق ابتداءً من السطح الظهري للقدم والذي يتكون على هيئة شبكة وريدية أولى تسمى القوس الوريدي الظهري للقدم ثم تتجمع هذه الشبكة مكونة الوريد الكعبي الإنسي متجهاً أمام العظم الكعبي الإنسي ثم يأخذ مساره مائلاً في الساق من الناحية الداخلية الأمامية للساق خلف الركبة من الجهة الإنسية ومن ثم مساراً مائلاً في الجزء السطحي الأمامي للفخذ لحين التقائه في الوريد الفخذي في منطقة المغين.
- ٢- لوحظ أن جميع الجثث التي تم تشريحها كان الوريد الصافن بها متناظراً ولوحظ وجود اختلاف تشريحي في ساق واحدة لجثة رجل حيث لوحظ وجود وريدي صافن يبدأ تحت الركبة بحوالي ٧ سم ويلتقيان فوق الركبة بـ ٧ سم وجثة أخرى فيها وريد صافن ثانوي مواز للوريد في منطقة الفخذ ويلتقي مع الوريد الفخذي فوق مدخل الوريد الصافن الكبير بشكل منعزل في منطقة المغين.

Introduction

The venous drainage of the lower limb varies considerably in its arrangement from subject to subject and even from limb to limb.

The following descriptions are considered to be the most common [1].

The venous drainage of the lower limb is divided into a superficial venous system and a deep venous

system. The superficial veins run in the subcutaneous tissue, between the skin and the deep fascia, and the deep veins are deep to the deep fascia and accompany all major arteries. Superficial and deep veins have valves, that are more numerous within the deep veins [2,3,4].

The superficial venous system of the lower limbs is represented by the great saphenous (long saphenous), the small saphenous (lesser saphenous), and their tributaries. The superficial and deep venous systems communicated with each other by the perforating veins [5].

The great saphenous vein is described to be the longest vein in the body, perhaps only because it does not change its name from one area of the lower limb to the other. This vein lies in a membranous sleeve of fascia which separates it from the more superficial venous channels. It is the thickest walled superficial vein of the lower limb containing many valves which diminish the pressure on the distal part of its wall [6].

Varicosities in the lower limbs are one of the most important afflictions of the venous system, as well as one of the most common of the peripheral vascular disorders [6]. Varicose veins are abnormally tortuous (dilated, swollen) veins, which are visible just below the skin surface, especially on the erect position. They are always caused by a fault in the one-way valves inside the veins at the point where the superficial veins communicate with the deep veins (which convey all of the blood towards the heart).

If the valve leaks, then blood will flow backwards [reflux, reverse flow] towards the area with low pressure, assisted by gravity on standing. This reverse flow increases pressure in the superficial veins,

which, as blood stagnates, become swollen and varicose [9].

The great frequency of varicosity in the saphenous veins is considered to be caused by high back pressure within these vessels, and is attributed to the long maintained erect posture and the tall column of blood from the leg to the heart [7]. Varicose veins are common in the posteromedial parts of the leg [3].

The great saphenous vein is commonly used for coronary arterial bypass because:

- It is readily accessible.
- Sufficient distance occurs between tributaries and perforating veins so that usable lengths can be harvested.
- Its wall contains a higher percentage of muscular and elastic fibers than other superficial veins.

Saphenous vein graft is used to bypass obstruction in blood vessels e.g. intracoronary thrombus. When part of great saphenous vein is removed for a bypass, the vein is reversed so that the valves do not obstruct the blood flow in the graft [2]. Because there are so many other leg veins, the removal of the great saphenous vein rarely produces a significance problem in the lower limb or seriously affects the circulation, provided that the deep veins are intact. The patency of vascular grafts and Long-term results of coronary bypass grafting are dependent upon patent grafts. Reversed saphenous vein graft patency rate is approximately 80 to 85 per cent at 1 year, and 45 to 50 per cent at 10 years [8,10].

Aim of Study

1- To describe the detailed anatomy of the great saphenous vein and its configuration and anatomical importance

2-study the incidence of double vein occurrence and the possible recurrence risk after varicose vein surgery.

Materials and Method

Subjects

The study made use of cadavers. 10 Embalmed cadavers used for practical demonstration at the Department of Human Anatomy Al-Nahrain University College of Medicine and Babylon College of Medicine.

10 Embalmed Cadavers were dissected, 8 of them were males and 2 were females. The age was ranging between (30-60) years. Embalming was performed at the Department of Human Anatomy-Al-Nahrain University College of Medicine and Department of Human anatomy-Babylon College of Medicine using

the modified embalming solution employed in the embalming procedures which consist of the following:

(8% ethyl alcohol, 6% glycerol, 2% phenol, 68% water, 40% formalin).

The embalming was done according to the procedure detailed in Hamash and Al-Salihi [12]. The cadavers were preserved for more than one month in this solution before dissection done.

Dissection

The basic procedures for anatomical dissection were based on the rules, methods and guidelines that are outlined in Shearer's [6] (Figure 1).



Figure 1 Lines drawn on the lower limb prior to its dissection to reveal the gross anatomy of the great saphenous vein.

Dissection of the great saphenous vein

The cadaver was put in the supine anatomical position and an incision was performed in the medial side of the thigh from inguinal ligament to the medial surface of the knee. Meticulous care was taken during the dissection of the lower limb and the relations of the great saphenous vein segments to the

subcutaneous tissue were preserved in all cases.

Making incisions through the skin, the skin was reflected from the superficial fascia and turned laterally down to the knee joint; there is very little superficial fascia at the knee, care was taken not to destroy the cutaneous structures, nerves, and vessels. The dissection of the lower limb continued to find the great

saphenous vein in the superficial fascia of the medial surface of the leg.

The vein was traced downwards to the ankle joint of the great saphenous vein passes anterior to the medial malleolus, downwards to the point where it turns laterally, making arch at the dorsal surface of the foot. The remainder of the superficial fascia was removed and the great saphenous vein traced upwards as the vein was sharply, turned was through the deep fascia to link the femoral vein at the saphenous opening[6].

Anatomical consideration

From the ten cadavers that were dissected during this study, (16 limbs for males and 4 limbs for females), the following anatomical observations were recorded for each region in which the great saphenous vein passed.

At the foot region

- The anatomical configuration of the dorsal venous arch and the site of entrance of the dorsal digital veins.
- Location of the medial malleolar perforator.

At the leg region

- The course of the great saphenous vein and presence of bifurcations.
- The number and topography of the perforators.

At the thigh region

The course of the great saphenous vein and presence of the possible perforators.

At the inguinal region

- Junction of the great saphenous vein with venous tributaries.
- The anatomical feature of the saphenous opening.
- Presence of the accessory venous channels and valves.

Results

Anatomical observations at the foot region

During dissection of ten cadavers, the great saphenous vein aroused anatomically as a continuation of the dorsal venous arch at proximal part of the metatarsal bones in 14 limbs (70%) (figure 2) and in the rest 6 limbs (30%), the origin was not exactly forming an arch but it started as a continuation of the first common metatarsal vein on the medial side of the big toe and received communications from the dorsal digital veins.

In 2-4 limbs (10-20%) several small perforators were demonstrated in the foot communicating the dorsal venous arch with deep vein of the foot.

Anatomical observations at the ankle region

The anterior medial malleolar perforator located about 5 cm above the ankle joint arising from the main long saphenous vein. It was demonstrated in 6 limbs (30%). Others were situated at a distance of (7 cm) from the sole of the foot.

Anatomical observations at the leg region

The vein runs in the subcutaneous fascia on the medial aspect of the leg anterior to the medial malleolus in all limbs (100%) within a sleeve of membranous sheath at the posteromedial surface of the leg, it passes obliquely behind the medial condyles of the tibia and medial surface of the knee joint about four finger breadth from the medial border of the patella (Figures 3 and 4).

In 2 limbs (10%), the great saphenous vein was doubled and bifurcated at the medial aspect of the leg. Each vein communicated with the deep veins through its own perforator. These veins were united 7 cm above the knee joint and continued as a single trunk in the thigh.

Anatomical observations at the thigh region

The vein passed on the

anteromedial aspect of the thigh within the subcutaneous fascia to reach the saphenous opening to communicate with the femoral vein.

Anatomical observations at the inguinal region

All the tributaries of the great saphenous vein join the main trunk before it entered the femoral vein in all limbs (100%).

The great saphenous vein passed through the saphenous opening which was located about 4cm lateral to

2cm in width, 2.5cm in length.

2 limbs (10%) were noticed to have an accessory saphenous vein running parallel to the main trunk; they drain separately to the femoral vein (figure 5).

Valves along the course of the great saphenous vein were presented as saccular structures. The valve at the saphenofemoral junction opened and it was formed of two cusps and some of these valves along the whole length of the vein were opened; they were composed of 2 cusps (bicuspid).

Site of commencement	Dorsal venous arch demonstrated in 14 limbs (70%)	Not defined in 6 limbs (30%)
Relation to the medial malleolus	Anterior in 20 limbs (100%)	others 0%
Course in the leg	18 limbs (90%) on the medial aspect of the leg	bifurcation 2 limbs (10%) double vein
Relation to the medial tibial condyle	Anterior 20 limbs (100%)	others 0%
Course in the thigh	Enter the saphenous opening in 20 limbs (100%)	Others 2 limbs (10%) double vein

the pubic tubercle, it measured about

Table 1 Summary of observations regarding the course of the great saphenous vein.



Figure 2 The dorsal venous arch (red arrow) with the common dorsal digital veins entrance which continue on the medial side of the foot as the medial marginal vein of the foot (yellow arrows).



Figure 3 The course of the great saphenous as it passes anterior to the medial malleolus then on the medial aspect of the leg (black arrows).



Figure 4 The course of the great saphenous vein in the leg. The vein passes on the medial side of the leg (red arrow) then posterior to the medial tibial condyle (green arrow).

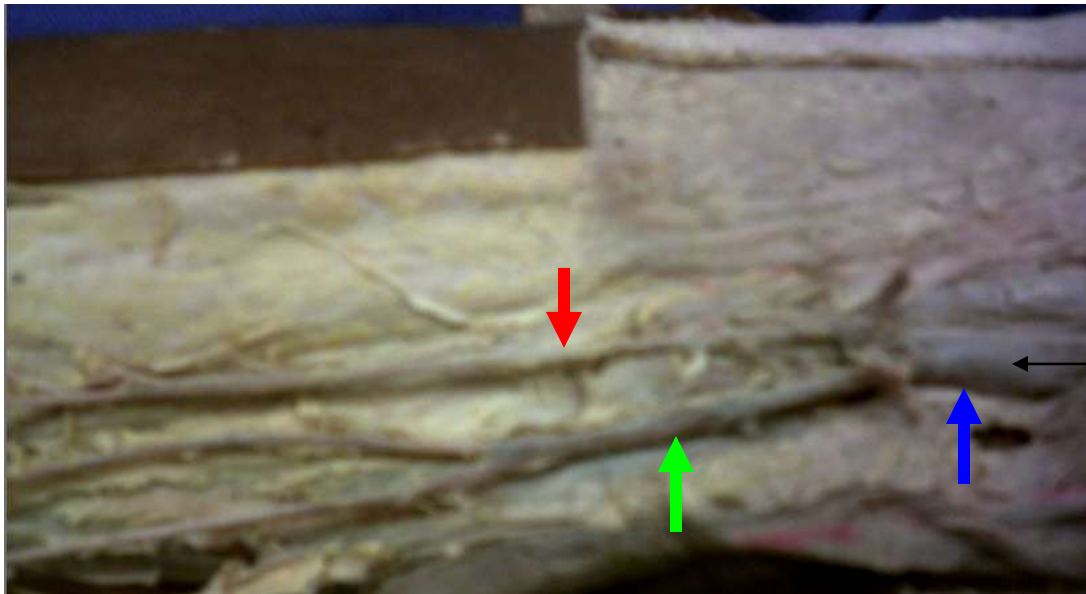


Figure 5 The course of the great saphenous vein in the thigh (red arrow) with an accessory vein on its medial side (green arrow), and the site of joining with femoral vein at saphenofemoral junction (blue arrow).

Discussion

In (20%) of cases, the great saphenous vein was doubled; (10%) in the calf and (10%) in the thigh. Each one of the duplicated veins communicated with the deep veins through its own perforator.

Anatomical textbooks described the long saphenous vein as a continuous single trunk along the medial aspect of the thigh and the calf muscle receiving anterior and posterior tributaries along its course. Few reports mentioned the incidence and pattern of duplication or had drawn the attention to the possible role of this variation as a source of recurrence varicose vein. The long saphenous vein has an important role as an autograft for arterial bypass surgery [12]; as a consequence its anatomical variations including duplication received great attention. The incidence of duplication had been reported in other studies to be between 1 and 52% [13].

In one study that used contrast sphenography, the incidence was 50% and was categorized into thigh, thigh and calf and only calf duplications[13].

Reports that mention that saphenous vein duplication is quite common have done so as part of preoperative vein assessment before arterial bypasses surgery, yet there are also possible implications for recurrence after varicose vein surgery arising from a persistent trunk of a duplicated great saphenous vein but this could only be confirmed by a prospective study[12].

In our study, the incidence of duplication was 20% and was detected only unilaterally. It is interesting to know that duplications in both limbs are very rarely suggesting that genetic factors have little role in determining venous anatomy [13].

Conclusions

1. A considerable degree of variations in the normal anatomy of the great saphenous vein was detected. Even there were variations between both limbs in the same subject. These variations were in the course of the vein, the sites and numbers of perforators.

2. The great saphenous vein started anatomically as a continuation of the dorsal venous arch at proximal part of the metatarsal bones in (70%) of cases and in (30%), the origin started as a continuation of the first common metatarsal vein.

3. The anterior medial malleolar perforator usually located about 5 cm above the ankle joint arising from the main long saphenous vein. It was demonstrated in 6 limbs (30%). Others were situated at a distance of (7 cm) from the sole of the foot.

4. In (20%) of cases, the great saphenous vein was doubled; (10%) in the calf and (10%) in the thigh; each one of the duplicated veins communicated with the deep veins through its own perforator.

Suggestion for Further Studies

- It is recommended to increase the number of dissected specimens in order to make a clearer image regarding the number and site of these perforators.

- Techniques such as sphenography and duplex imaging are recommended to be used to examine these perforators as they permit examination of large number of subjects making the results more statistically significant.

- Study the criteria of the great saphenous venous valves and compare this with abnormal valves along the whole length of the vein.

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