

# The great saphenous vein in nigerians, a pilot study

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## Abstract

The great saphenous veins of 18 lower limbs (7 right and 11 left) were studied. The general anatomy of these veins shows that there are no differences between the left and right veins. However, the age-long teaching that the distance between the vein and the medial edge of the patella corresponds to the width of the hand was not confirmed by this study. The mean distance was matched with the mean width of the hands of 91 medical students (55 male and 36 female), with noticeable differences. In addition to this finding, it was also found that the number of valves in the upper part of the lower limb is more compared to that of the lower part using the knee joint as the reference point. This is also in contrast to the usual teaching. The constant presence of a valve at the saphenofemoral junction was also not corroborated by this study. Although preliminary, this study is an indication that the data usually reported in anatomy textbooks are likely to have been collected from studies with cadavers of Caucasian extraction. It is worth mentioning that further research is needed to generate data that will best describe the anatomy of Negroes' great saphenous veins.

**Keywords:** veins, great saphenous, saphenofemoral junction, venous valves.

## 1 Introduction

The great saphenous vein is the longest vein in the body lying on the medial side of the lower limb (ROMANES, 1996). Of all the superficial veins of the lower limb, it is the vein with the thickest wall (ROMANES, 1996). It runs entirely within the subcutaneous fat without an accompanying artery (BASMAJIAN and SLONECKER, 1986).

The vein begins on the medial side of the ankle as a direct continuation of the medial marginal vein of the foot at the medial end of the dorsal venous arch (ROMANES, 1996; BASMAJIAN and SLONECKER, 1986; GARG, 2004; PICKERING PICK and HOWDEN, 1995). The classical point of commencement of the vein is usually the medial malleolar region. However, there may be a distal extension of it which is of comparable diameter with the medial malleolar portion (PICQUET, COIFFARD, PECHARD et al., 2006).

The vein courses upwards anterior to the medial malleolus, (GARG, 2004) crossing the lower two-thirds of the leg on its medial surface subsequently taking a slightly more posterior course towards the knee joint about a hand's breadth behind the medial edge of the patella (BASMAJIAN and SLONECKER, 1986). In the thigh, the vein inclines anteriorly to lie on the antero-medial surface of the thigh in its lower third, while in the middle third it takes a more anterior position from where it ascends to the saphenous opening piercing the cribiform fascia draining into the medial side of the femoral vein (ROMANES, 1996; BASMAJIAN and SLONECKER, 1986; GARG, 2004).

The great saphenous vein contains numerous valves. Authors are divergent on the number of the valves present within this vein. The average quoted figure ranges between 10 and 20 valves with more of them below the level of

the knee than above it (GARG, 2004; WILLIAMS and WARWICK, 1980). Few authors, however, quoted figures as low as 2-6 valves and more in the thigh region (PICKERING PICK and HOWDEN, 1995). The valves are meant to prevent back flow of blood especially due to gravity and or the pumping action of the muscle of the leg on the deep veins of the leg via the numerous communicating channels (GARG, 2004; PICKERING PICK and HOWDEN, 1995; WILLIAMS and WARWICK, 1980). The valves also help to break the blood in the vein into columns thereby reducing the pressure on the distal part of the vein (ROMANES, 1996). One valve appears to be constant at the saphenofemoral junction (GARG, 2004). The failure of these valves results in varicosity of the vein, its commonest disfiguring affliction which may require surgery. Of all valves within the vein, the one at the saphenofemoral junction is the most important regarding venous varicosity (ENGELHORN, CA., ENGELHORN, AL., CASSOU et al., 2005). This age-long belief is being challenged by the findings of other researchers. It has been found that other causes of venous varicosity such as deep valvular incompetence and incompetence of some venous perforators do exist (HANRAHAN, KECHENJIAN, CORDTS et al., 1991).

The effort at saving the varicose great saphenous vein in vascular surgery is a worthwhile one because it remains one of the best grafts for vascular reconstruction (YAMAKI, NOSAKI and SASAKI, 2002). Varicosity of the great saphenous vein occurs in an appreciable number of the general population (GREEN, 1992). It is said to affect up to one-quarter of the western populace. Despite the high incidence, its etiology is a subject of intense controversy (FOWKES, LEE, EVANS et al., 2001). It has been found that the

incidence of varicosity is not dependent on age, sex, height, weight, body mass, or parity (BEAGLEHOLE, PRIOR and CLARE, 1975); other workers, however, observed that the anomaly is sex dependent, been more common in women (AMELI, 1986).

## 2 Material and methods

A total of 18 limbs (consisting of 7 right and 11 left) of adult cadavers of Nigerian extraction were used in this study. They were sourced from the gross anatomy laboratory of the College of Health Sciences, Olabisi Onabanjo University. After cleaning the limbs, the great saphenous veins were fully exposed. The length of the great saphenous veins were measured with a flexible tape measure beginning at the saphenofemoral junction to the level of the medial malleoli following the course of the undisplaced vein. On the medial side of the knee joint, the distance between the medial edge of the patella bone and the undisplaced veins was measured using the tape measure. The caliber of the vein throughout its entire length was noted.

Subsequently, the veins were opened longitudinally with dissecting scissors from the saphenofemoral junction to the level of the medial malleoli. The total number of valves was counted. The number of valves above and below the knee level was also noted down. The distance of each valve from the saphenofemoral junction was measured.

In addition, the width of the right hands, across the heads of the metacarpals excluding the thumb, of 91 medical students consisting of 36 female and 55 male was measured with the use of a tape measure. Results were presented as means and standard deviations while the student T-test or the Anova test was used where appropriate. P-value less than 0.05 ( $p < 0.05$ ) was considered to be significant.

## 3 Results

The various data about the general anatomy of the GSV are shown in Table 1. There were no significant differences between the right and left limbs. The mean values were compared with the established values to detect possible racial variations. It was noted that the caliber of the GSV expectedly increased as it approached its termination in the femoral vein. There were few valves at the saphenofemoral junction (Table 2). Table 3 shows the width of the hands of the randomly picked medical students.

## 4 Conclusion

The great saphenous vein is similar between the right and the left limbs (Table 1). Since isolated limbs were used, the

length of the vein could not be related to the height of the cadaver. The distance between the medial edge of the patella and the vein averaged 8.24 cm. The mean width of the hands of the medical students is 8.63 cm while the mean values for the male and female medical students are 8.95 and 8.15 cm respectively. Subjecting the mean values to the ANOVA test revealed that the differences in mean between the sexes are significant ( $F = 21.19, p < 0.05$ ). The mean value for the female medical students is closer to the distance between the vein and the edge of the patella. This shows that the age-long teaching that the great saphenous vein is a hand breath away from the medial edge of the patella may not be completely true for Negroes.

Table 1 shows the total number of valves in the vein. The mean value for the number of valves differs from the average number of either 10-15 or 15-20 quoted by most authors (AMELIA, 1986; CHUMMY, 1999; ENGELHORN, 2005). Although this study is a preliminary one, this result is enough to warrant a further and deeper study of non-Caucasian bodies. This difference may be significant especially when the distribution with respect to the knee is considered. There are more valves above the knee than below it without any significant laterality. This is also in contrast to the usual assertions that there are more valves below the knee than above it. It is also interesting that the claim that there is always a valve at the saphenofemoral junction is not confirmed by this study. Therefore, for the purpose of vascular grafting, the first 10 cm of the vein using the saphenofemoral junction as the reference point will often yield valveless venous material. The portion of the vein below the knee will also be a good harvest site for such grafting material. This will be of immense help to vascular surgeons. It is imperative that more comprehensive studies should be carried out to authenticate the possible racial differences of surgical importance which have been suggested in this study.

**Table 2.** Presence of a valve at the saphenofemoral junction.

	Number of veins with saphenofemoral valve (%)	N
Both limbs	3 (16.7)	18
Right limb	1 (14.3)	7
Left limb	2 (18.2)	11

**Table 3.** Width of the right hand of medical students.

	Male	Female	Both sexes
Mean	8.946	8.147	8.630
Standard deviation	0.533	0.448	0.634

**Table 1.** Comparison between right and left limbs.

	Right limb		Left limb		T-cal	P-value
	Mean	Standard deviation	Mean	Standard deviation		
Length of GSV (cm)	81.43	3.445	82.86	6.116	0.634	>0.05
No of valves	8.286	1.80	6.909	1.514	1.681	>0.05
Valves above knee	5.143	1.574	4.636	0.809	0.789	>0.05
Valves below knee	3.143	1.345	2.273	1.191	1.399	>0.05
Distance from patella (cm)	8.59	1.24	8.02	1.50	0.876	>0.05
Position of first valve (cm)	11.57	7.912	15.86	10.49	0.984	>0.05

They should also include the assessment of any possible racial differences in the course of the great saphenous vein, its tributaries, as well as the positions and number of perforating veins.

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