



An anatomical study on the variations of short saphenous vein and its termination

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ABSTRACT

The short saphenous vein represents the post axial vein of developing limb bud. It is the continuation of lateral marginal vein. The short saphenous vein terminates in the popliteal vein in the popliteal fossa. Short saphenous vein varicosities are common. Recurrence of varicose vein after surgery is a frequent cause of medico legal problems. A thorough analysis on the presence of variations in the short saphenous vein and its termination is mandatory. Hence, the present study is conducted to observe the variations of the short saphenous vein in cadavers, enlightening the clinical significance for a better therapeutic outcome. 50 lower limbs from 25 embalmed cadavers of both the sexes are used for this study. Conventional dissection method is followed. In the present study, 54% of short saphenous vein terminates only into the popliteal vein at the popliteal fossa, 30% short saphenous vein terminates into the great saphenous vein, 8% of short saphenous vein terminates into the inferior gluteal vein and 8% of short saphenous vein terminates into the femoral vein. A proper knowledge about the anatomy of the short saphenous vein and its communications with other veins and mode of termination of short saphenous vein is mandatory for a safe and successful intervention. The high variations in the venous system, makes it to be a subject of interest, thereby emphasizing multidisciplinary studies for a better clinical outcome.

INTRODUCTION

“Saphenous” is a term with ambiguous meaning derived from ancient history. In Greek, the term “Saphenous” is derived from “Safaina”, meaning “evident”^[1], whereas in Arabic history, the term “saphenous” is derived from “el safin” meaning “concealed”. The Saphenous venous system includes the great saphenous and short saphenous veins. The short saphenous vein represents the post axial vein of developing limb bud. It is the continuation of lateral marginal vein. It ascends posterior to the lateral malleolus of fibula and courses lateral to the tendocalcaneus, accompanied by sural nerve. The short saphenous vein ascends medially to the midline of calf, reaches the popliteal fossa and terminates in the popliteal vein about 3-7.5 cm above the knee joint^[2].

The saphenous vein courses beneath the superficial fascia in its initial course, but later on, as the vein approaches the midline of the calf, it pierces the deep fascia to become deeper to it and passes between the two heads of gastrocnemius muscle and later on terminates in the popliteal vein. However the recent studies have doubted the penetration of crural fascia and have demonstrated that the short saphenous vein lies in its own saphenous compartment all through the course^[3].

Carlo Giacomini^[4] has reported the thigh extension of short saphenous vein which communicated with the great saphenous vein. Hence, such a vein is called as “Giacomini vein”. He has also demonstrated various pattern of termination of thigh extension of short saphenous vein. There are various studies which have demonstrated varying frequencies of the Giacomini vein in literatures.

Short saphenous vein varicosities are common. Recurrence of varicose vein after surgery is a frequent cause of medico legal issues. Giacomini vein is present in 2.5% to 10% of people, who have undergone phlebography because of varicosity^[5]. Since the duplex studies on the short saphenous vein have demonstrated clinical significance regarding the thigh extension of short saphenous veins and their flow pattern, a thorough analysis on the presence of variations in the short saphenous vein and its termination is mandatory. Hence, the present study is

conducted to observe the variations of the short saphenous vein in cadavers, enlightening the clinical significance for a better therapeutic outcome.

MATERIALS AND METHODS

50 lower limbs from 25 embalmed cadavers of both the sexes are used for this study from the department of Anatomy of our institution. The specimens were numbered serially. Conventional dissection method is followed to observe the course of the short saphenous vein and termination of the vein is observed.

Observation

In the present study, 54% of the short saphenous vein terminates only into the popliteal vein at the sapheno popliteal junction in the popliteal fossa. Table 1 shows the percentages of termination of short saphenous vein in the popliteal vein at the popliteal fossa and also the thigh extension of the short saphenous vein.

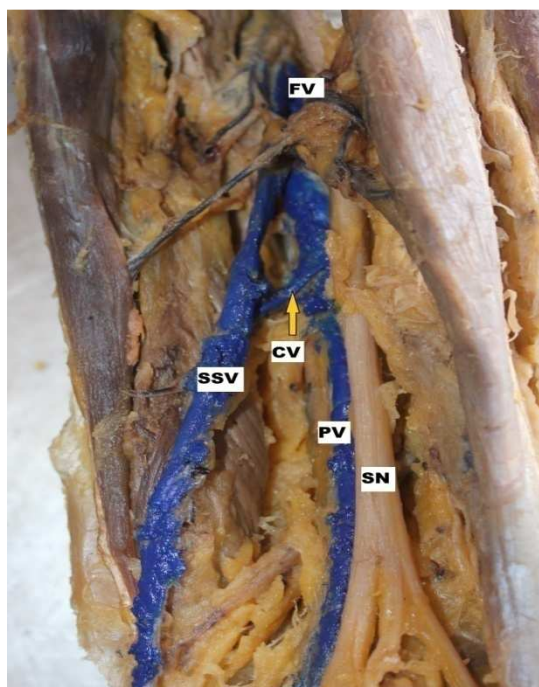
In 8% of specimens, a high sapheno popliteal junction is observed and in these specimens, the short saphenous vein drains into the femoral vein at the posterior aspect of thigh, after communicating with the popliteal vein in the popliteal fossa. [Figure 1]

In 98% of the specimens, irrespective of the thigh extension of short saphenous vein, communication between the short saphenous vein and popliteal vein exists in the present study. [Table 2][Figure 2]

Table 1: Termination of Short Saphenous vein

Termination of Short Saphenous vein			
At the popliteal fossa in the sapheno popliteal junction		Thigh extension of the short saphenous vein	
No. of specimens	Percentage	No. of specimens	Percentage
27	54	23	46

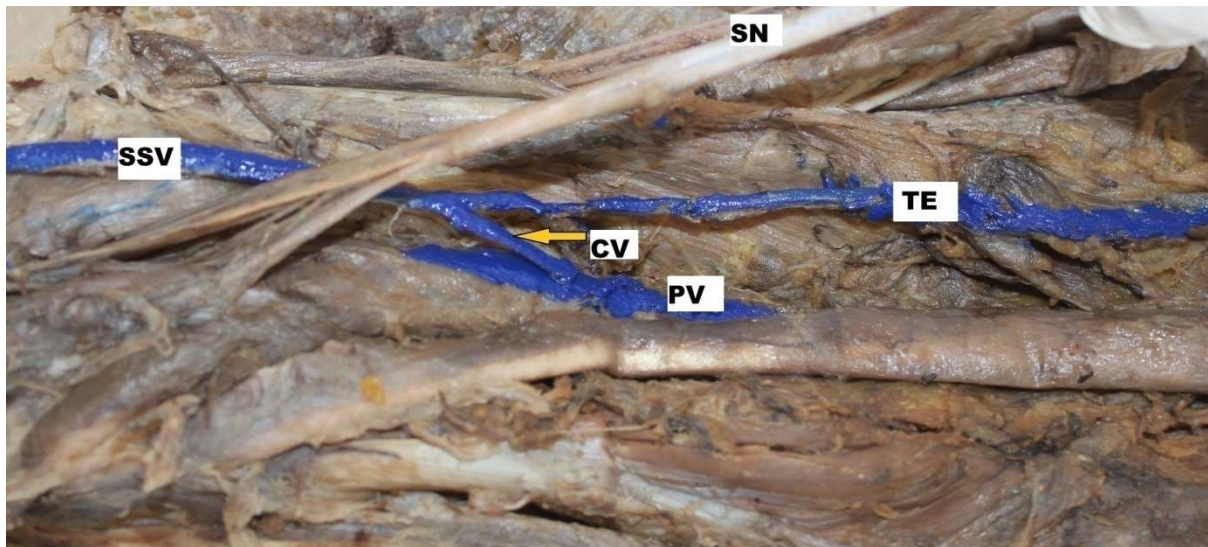
Figure 1: Showing termination of the short saphenous vein in femoral vein



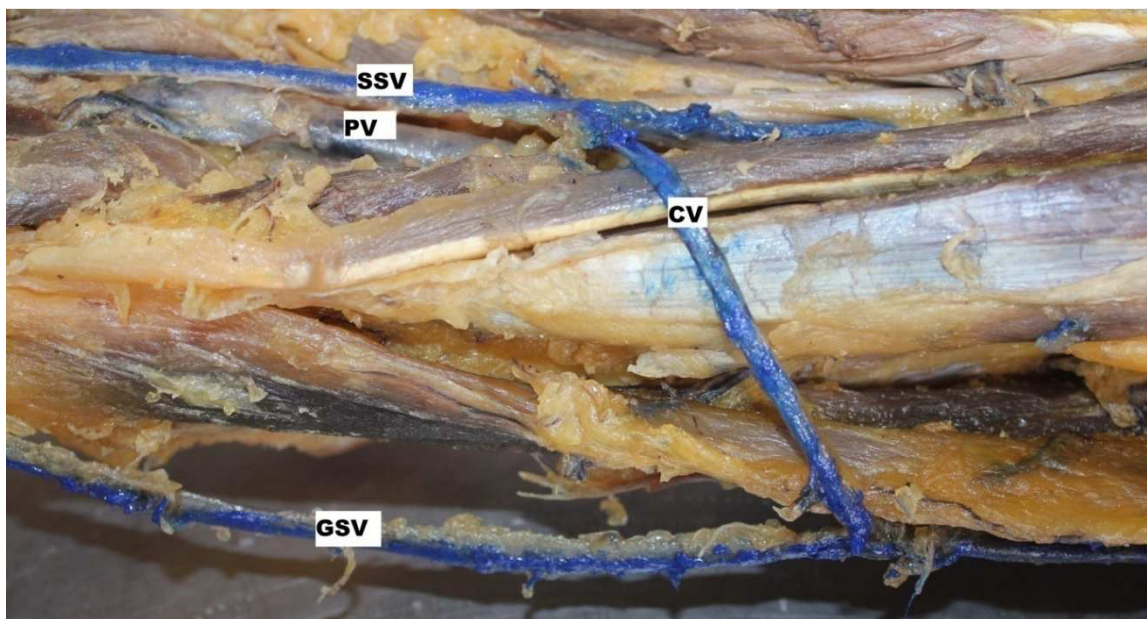
FV- FEMORAL VEIN; SSV- SHORT SAPHENOUS VEIN; CV- COMMUNICATING VEIN; PV- POPLITEAL VEIN; SN- SCIATIC NERVE.

Table 2: Relation of Short Saphenous vein with the Popliteal vein

Relation of Short Saphenous vein with the Popliteal vein			
Short saphenous vein terminates or communicates with the popliteal vein		Short saphenous does not terminate or communicate with popliteal vein	
No. of specimens	Percentage	No. of specimens	Percentage
49	98	1	2

Figure 2: Thigh extension of Short saphenous vein after communicating with popliteal vein

SSV- SHORT SAPHENOUS VEIN; CV- COMMUNICATING VEIN; PV- POPLITEAL VEIN; SN- SCIATIC NERVE; TE- THIGH EXTENSION.

Figure 3: Short Saphenous vein communicating with Great saphenous vein and extends cranially without communicating with popliteal vein

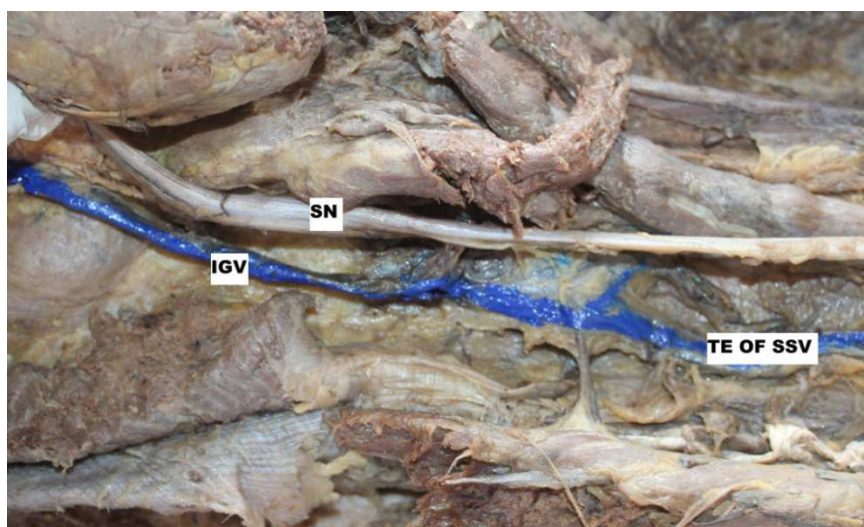
SSV- SHORT SAPHENOUS VEIN; CV- COMMUNICATING VEIN; PV- POPLITEAL VEIN; GSV- GREAT SAPHENOUS VEIN.

In the present study, 30% of the short saphenous vein terminates in the great saphenous vein in the proximal part of thigh, after communicating with the popliteal vein in the popliteal fossa. Thereby 30% of Giacomini vein is observed in the present study.

In one left lower limb, that is in 2% of the specimens, the short saphenous vein communicated with the great saphenous vein in the posterior aspect of mid-thigh and later the short saphenous terminated into the vena comitantes accompanying the inferior gluteal artery forming the inferior gluteal vein in the proximal part of posterior aspect of thigh.[Figure 3]

In 6% of the specimens, the short saphenous vein terminated in the popliteal vein and the thigh extension of the vein drained into inferior gluteal vein. Hence, in the present study, 8% of the short saphenous vein drained into the inferior gluteal vein. [Figure 4]

Table 3 shows the percentage of communication between short saphenous vein and great saphenous vein.

Figure 4: Short saphenous vein terminating with inferior gluteal vein

SN- SCIATIC NERVE; IGV- INFERIOR GLUTEAL VEIN; TE OF SSV- THIGH EXTENSION OF SHORT SAPHENOUS VEIN.

Table 3: Communication between Short saphenous and Great saphenous vein

Communication between Short saphenous and Great saphenous vein			
Presence of inter-saphenous communication		Absence of inter-saphenous communication	
No. of specimens	Percentage	No. of specimens	Percentage
16	32	34	68

In the present study,

- 54% of short saphenous vein terminates only into the popliteal vein at the popliteal fossa.
- 30% short saphenous vein terminates into the great saphenous vein.
- 8% of short saphenous vein terminates into the inferior gluteal vein.
- 8% of short saphenous vein terminates into the femoral vein.

DISCUSSION

The short saphenous vein represents the post axial vein of the developing lower limb. Embryologically, a single axis artery supplies the lower limb and the blood is returned to the cardinal system by means of pre axial and post axial veins. The great saphenous vein represents the pre axial vein. Developmentally, the marginal fibular vein which is the predecessor of short saphenous vein communicates with the posterior cardinal vein and thereafter with the ischiatic vein. The proximal part of this vein persists as inferior gluteal vein. After pelvic rotation, the external iliac vein communicates with the marginal fibular vein. During subsequent elongation of lower limb, adaptation of the venous channels would have taken place resulting in termination of short saphenous vein into the popliteal vein [6]. Due to the various communications in the developmental period, multiple variations are possible.

Variations in the mode of termination of the superficial veins are not uncommon. Aguinaldo de Oliveira et al [7] have classified three types of termination of short saphenous vein.

- Type I - Termination in the popliteal vein. This type has two subtypes: (a) termination exclusively in the popliteal vein, or (b) divided into two branches, one to the popliteal vein and the other to the greater saphenous vein;
- Type II - Termination in thigh veins or in deep veins (femoral vein/veins of the posterior aspect of the thigh) and/or in the greater saphenous vein. This type has three subdivisions: (a) deep veins of the thigh, (b) both the deep veins of the thigh and the greater saphenous vein, and (c) directly in the greater saphenous vein;
- Type III- Termination in leg veins, without reaching the popliteal region. This type has two subtypes: (a) termination in the greater saphenous vein of the; or (b) in the gastrocnemius veins.

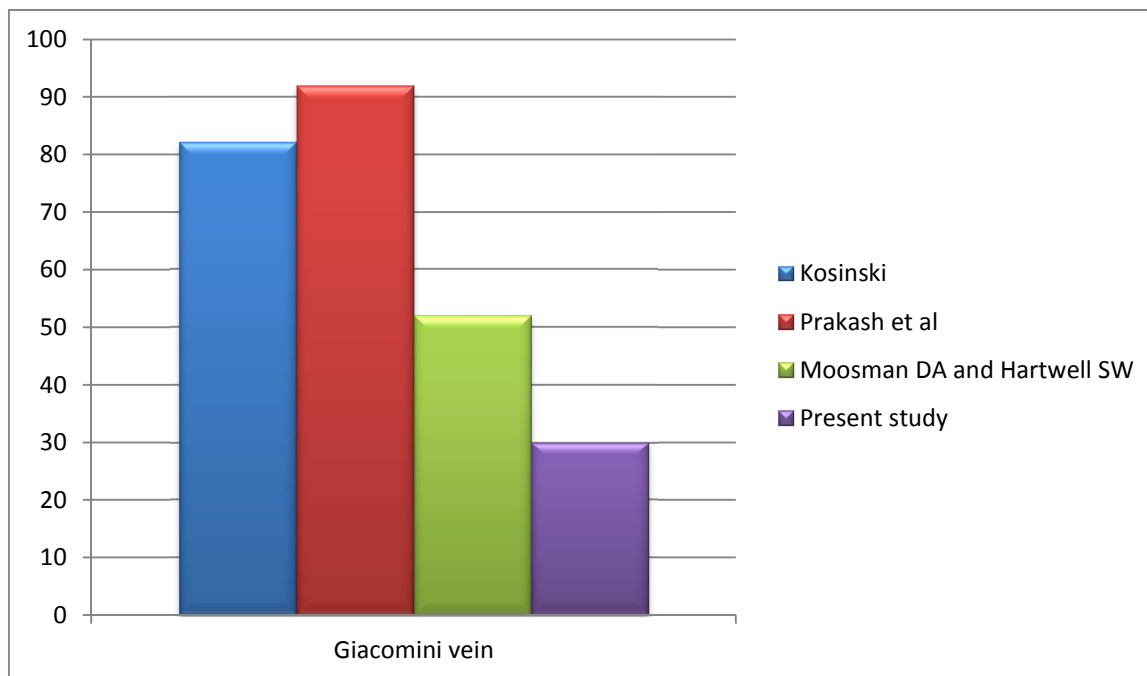
In the present study, 54% of type I(a), 30% of type I(b), 14% of type II(a) (with communication to popliteal vein in popliteal fossa), 2% of type II(b) are observed. Type II(c) and Type III are not observed in the present study.

In the present study, 8% of short saphenous vein terminated into the femoral vein. Prakashchandra Shetty et al [8] have reported one such case of termination of short saphenous vein into the femoral vein.

Kosinski [⁹] have reported 82.2% of Giacomini vein. Prakash et al [¹⁰] have reported 92% and Moosman DA and Hartwell SW [¹¹] have reported 52% of Giacomini vein. In the present study, 30% of the Giacomini is present, which is less frequent as compared with other studies, whereas the overall thigh extension of the short saphenous vein is 46%.

Chart 1 compares the frequency of presence of Giacomini vein by various authors.

Chart 1: Percentage of Giacomini vein



As recurrence of varicose vein following the surgical procedures has become an important medico legal issue, understanding the proper anatomy of the venous channels has become mandatory. Due to increased frequency of variations of the anastomotic channels of short saphenous vein, involvement of varicosity in both the saphenous system is possible. Flush ligation procedure reduces the chance of recurrence of varicose vein. Short saphenous vein varicosity may lead to severe pain in the leg, if the tibial nerve is involved in the vicinity of the arch of short saphenous vein.

Delis K T et al [¹²] have opined that the Giacomini vein is 10 times less susceptible to valvular incompetence, when compared to both great saphenous and short saphenous veins. He has also suggested that Giacomini vein can be considered for arterial bypass surgery in infra-inguinal arterial reconstruction.

CONCLUSION

A proper knowledge about the anatomy of the short saphenous vein and its communications with other veins and mode of termination of short saphenous vein is mandatory for a safe and successful intervention. Communications of the short saphenous vein with the great saphenous vein must be looked for before harvesting the great saphenous vein for procedures like coronary artery bypass grafting. Hence, the communications and variations of the short saphenous vein must be noted to prevent recurrence of varicose veins following surgical procedures. The high variations in the venous system, makes it to be a subject of interest, thereby emphasizing multidisciplinary studies for a better clinical outcome.

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