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Study of Variation of Great Saphenous Veins and Its Surgical Significance (Original Study)

Dr Surekha W. Meshram[1], Dr. Yogesh Ganorkar[2], Dr V.P. Rukhmode[3], Dr. Tarkeshwar Golghate[4]

[1](M.B.B.S,M.D) Associate Professor, Dept. of Anatomy Govt. Medical College Gondia, Maharashtra
[2](M.B.B.S,M.D) Assistant Professor, Dept. of Anatomy Govt. Medical College Gondia, Maharashtra
[3] (M.B.B.S, M.S) Professor and Head, Dept. of Anatomy Govt. Medical College Gondia, Maharashtra
[4](M.B.B.S, M.D) Assiciate Professor, Dept. of Anatomy Govt. Medical College, Nagpur, Maharashtra
Corresponding Author: Dr. Surekha W. Meshram

Abstract
Introduction: Veins of lower limbs are more involves for various venous disorders as compare to upper limbs. Most common venous disorders occurring in lower limbs are varicose veins, deep venous thrombosis and venous ulcers. Varicose veins are found in large population of world affecting both the males and females. Surgical operations are performed in all over the world to cure it. In the varicose vein surgery, surgeon successfully do the ligation as well as stripping of the great saphenous vein and its tributaries. Duplication of a great saphenous vein can be a potential cause for recurrent varicose veins after surgery as well as complications may occur during the surgery.
Method: *The present study was done by dissection method on 50 lower limbs of cadavers. Its aim was to identify the incidence and pattern of duplication of long saphenous vein in Indian population. The dissection was done as per Cunningham's manual of practical anatomy and the incidence of duplication of great saphenous vein was noted.*
Result: *Duplications of great saphenous veins were seen in thigh region of 10 lower limbs. In the leg the course of veins were found within normal limit.*
Conclusion: *Duplication of veins is one of the most common reason behind recurrence of varicose veins and makes the surgical procedure complicated. The duplicated great saphenous vein also used for the extraction of procedures i.e coronary artery bypass graft and cerebrovascular disorders. Therefore this study would serve a great hope for surgeons and clinicians.*
Keywords: *Varicose Vein, Coronary surgery, Cerebrovascular disorders.*

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I. Introduction:

Veins of lower limbs are more involves for various venous disorders as compare to upper limbs. Most common venous disorders occurring in lower limbs are varicose veins, deep venous thrombosis and venous ulcers. So it is very important to have the detailed study of these veins.The veins of lower limbs are divided into three sets.(1) Deep veins (2) Perforating veins and (3) Superficial veins. Deep veins runs below the deep fascia along with the arteries and superficial veins in the superficial fascia. Perforating veins connects the deep veins with superficial veins. Venous return from the lower limbs has to ascend to the heart against gravity. For this ascends deep veins as well as superficial veins of lower limbs are provided with numerous valves along their course. These valves when competent, allow blood flow towards heart. Incompetency of these valves causes a disease known as varicose veins. Incompetency of the valves occurs at the junction where superficial vein communicates with deep vein Great Saphenous vein is the longest vein in the body. This vein as well as short saphenous vein mainly involved in varicose vein disorder. Varicose vein is a well known and common disorder of veins present in 6% of population. In this disorder vein becomes tortuous, dilated and swollen and in severe cases patient may develop venous ulcers. Symptoms of varicose veins are burning pain in lower limb, heaviness and fatigue. At the end of disease patient may shows hyperpigmentation and thrombophlebitis also. This disease is mainly found in person who stands for prolonged period like bus conductors, female having more pregnancies and obese person.

The Great saphenous vein is the longest superficial vein of lower limb.The great saphenous vein (GSV) is the continuation of medial marginal vein of foot. It ascends into the leg, a little in front of the medial malleolus and lies on medial surface of tibia. Ascending on the medial side of leg, it crosses the medial side of

knee joint and ascends on medial side of thigh. In the upper part of the thigh, it passes somewhat laterally and passes through an aperture in the deep fascia known as saphenous opening to end in the femoral vein. The great saphenous vein has many tributaries from the front and back of the leg and from the front of the thigh.

During its course there are variations of the GSV at the level of leg, knee and thigh. Many researchers found that there is positive correlation between duplication of GSV and recurrence of varicose veins even after the successful surgery. So this study was done to note the variations in GSV in Indian population and exploration of its clinical and surgical approach.

In emergencies requiring transfusions, when the vein can not be seen, it is useful to remember that this great saphenous vein is constantly located immediately infront of the medial malleolus. An incision at this site to expose the vein is termed as "saphenous cut down". Segments taken from this vein are used as graft in peripheral arterial diseases, coronary artery surgery and cerebrovascular disorders.

II. Aims and Objective

1. To study the variation in formation of great saphenous vein.
2. To study the co-relation between duplication of the great saphenous vein and varicose vein.
3. To help the surgeons and clinicians and to prevent complication after varicose vein surgery due to duplication of great saphenous vein.

III. Material and Methods

In the present study cadaveric dissection was conducted on 50 lower limbs, fixed in 10% formalin belonging to both sexes aged between 35-70 years . The dissection was done from the cadavers provided to the first year MBBS students in the Department of Anatomy at Shri Vasantrao Naik Government Medical College Yavatmal Maharashtra, during year 2013 to 2015 .GSV is exposed by superficial dissections of superficial fascia in front of medial malleolus i.e at the beginning of GSV at the ankle joint up to its termination into the femoral vein at the saphenous opening.The limbs which show variations in saphenous vein were photographed.

IV. Observations

In the present study Out of the 50 lower limbs studied, five patterns of duplication of GSV is seen. These patterns are explained in detail as follows.

Pattern No. 1: 10 (5%) limbs showed some form of duplication of long saphenous vein in the thigh. In 5 limbs the duplication was started just near the knee joint, on the medial side of the thigh being accompanied by medial cutaneous nerve of thigh. The accessory saphenous vein joins the GSV on medial side at the level of knee joint then runs from medial to lateral side of knee joint and then runs straight upwards to join the GSV. This GSV then opens into femoral vein. However the formation and rest of the course of GSV were usual.The accessory great saphenous and great saphenous vein ascend in close proximity to one other with the saphenous nerve. The calibre of main great saphenous vein was larger than the accessory saphenous vein. The two veins joined to form a common trunk of approx 1 cm in length pierced the deep fascia just below the inguinal ligament at mid-inguinal point to drain into the femoral vein. The course of rest of vein in leg is as usual.

Figure-1 Duplication of the GSV from knee level to base of Femoral triangle.

Pattern No. 2: 10 (5%) limbs showed some form of duplication of long saphenous vein just above the ankle level. In 5 limbs the duplication was started just above the ankle joint, on the medial side of the leg the two vein runs in close proximity to each other approximately at mid leg level the two veins joined with each other to form a single vein . This vein then runs straight upwards as GSV. This GSV then opens into femoral vein.The formation and rest of the course of GSV were usual.

Figure 2: Specimen Showing duplication of Great Saphenous vein just above the ankle joint up to the mid leg level.

1. Great Saphenous Vein
2. Accessory Great Saphenous Vein
3. Dorsal Venous Arch

Pattern No. 3: In other 5 lower limbs great saphenous veins are duplicated at middle of the thigh, both the veins runs in close proximity to each other in the femoral triangle medial to femoral artery. At the apex of femoral triangle there is communication between the GSV and AGSV. Both these veins pierces cribriform fascia separately and have separate openings in the femoral vein.

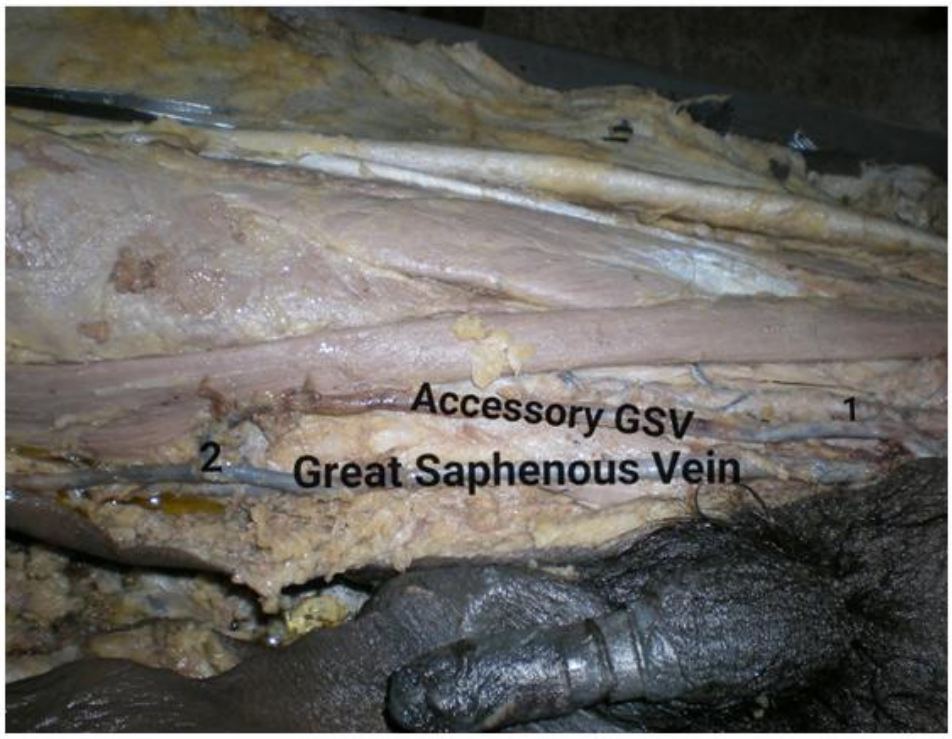

Figure-3 Specimen showing duplication of GSV at mid thigh level.

1 -Femoral Artery
2- Communication between Accessory Great Saphenous Vein and GSV

Pattern 4: (Fig:4): Two specimens Shows duplication of GSV just 15cm below the knee joint.
The GSV runs and AGSV crosses the knee joint and runs in close proximity to each other crosses the femoral triangle and the two veins joined to form one before opening into femoral vein.

Figure 4: Specimen Showing duplication of Great Saphenous vein just below the knee joint upto the opening of cribriform fascia

1. Accessory Great Saphenous Vein
2. Great Saphenous Vein

Pattern (5): (Fig. 5): Three specimens shows duplication of Saphenous vein of left limb just near the ankle joint. The variant vein run with adjacent to normal vein up to the knee joint and then join with the Great Saphenous vein to form single trunk which runs upwards as usual to open into femoral vein

Figure 5: Specimen Showing duplication of Great Saphenous vein just near the ankle joint up to the level of knee joint.

1. Great Saphenous Vein
2. Accessory Great Saphenous Vein
4. Ankle joint
5. Knee joint

Table :

Sr. No.	Pattern	No. of limbs	Male	Female
1.	Duplication in the whole thigh	5	4	1
2.	Duplication in the mid thigh level	5	3	2
3.	Duplication just below the knee joint	2	2	-
4.	Duplication in the middle of leg	3	2	1
5.	Duplication at the ankle level	2	2	0

V. Discussion

The great saphenous vein is the important vein of the lower limb. It is connected with deep veins with the help of perforating veinsand has key role in the venous return of lower extremity [1]. It is used as an autograft in coronary arterial bypass operations, various peripheral vascular surgeries and cerebrovascular surgeries. [3,4]. Varicose vein occurs due to chronic venous insufficiency of lower limb and one of painful disease affecting both males and females. In this disease the veins are prone to venous ulcers which is a very painful condition [5].This disease has very bad effect on productivity and quality of life. Proper operative procedure should be done to prevent recurrence and complications.[6] Recurrence of varicose vein is a serious condition that might arise from the persistent trunk of duplicated great saphenous vein. The various tributaries which join together to form the Great Saphenous veins are the superficial epigastric vein, the external pudental vein, the superficial circumflex iliac vein , medial accessory saphenous vein and the lateral accessory saphenous vein.[7,8].

Duplication of GSV is a rare Anatomical variation affecting very less population near about 1-2% of total population. The variation of GSV has been reported by researcher by saphenogram or USG but there are very few cadaveric studies. Aydin Kurt etal by USG has reported a rare type of variation of opening of Great Saphenous Vein.[9] Chen and Prasad by USG reported only 1% of duplication of GSV in thigh region only.[10]The present study is the detailed cadaveric study showing five types of incidence of duplication of the great saphenous vein. In the present research work duplication was reported to be 32% in the Vidharbha region Indian population. A variable incidence of duplication of long saphenous vein has been reported by Motwani et al in his study on North Indian Population . He Found 8.9% of duplication.[11] Glasser et al [12] found in 3% of cadaveric specimens. Haythem and sayigh in study on Iraq population observed in 20% of lower limbs,[13]. Ruoff et al [14] noted duplication in 18% of lower limbs. While Donelly et al reported duplication in 9% of cadavers,[15]. Van Dijk et al in 20% of the cases observed the duplication by duplex examination of lower limb.[16] . Corrales et al by phlebography process noted a high duplication rate of 49%, [17] which is in close proximity to the results of the present study.

Tothonglor [18] found that duplication of great saphenous vein causes post operative complication of Varicose Vein. They also reported trauma to sartorial branch as postoperative complication of ankle surgery and on arthroscopic examination. If duplication of great saphenous vein is present, surgeons have to do careful examination of lower limb before planning any surgery of lower limb. Because in double great saphenous vein there will be recurrence of varicose vein even after the surgery. But the duplication of the GSV has significant , easy role in the proceedures like extraction for coronary artery bypass graft and cerebrovascular disorders.

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