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# STUDY ON THE GREAT SAPHENOUS VEIN INCLUDING ITS SURGICAL AND RADIOLOGICAL IMPLICATIONS IN POPULATION OF INDORE IN MADHYA PRADESH

Clinical Anatomy

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## ABSTRACT

**Background:** The great saphenous vein (GSV) is the longest vein in the body and is of significant surgical and radiological importance. It is a superficial vein that runs along the medial side of the leg and thigh, and terminates at the saphenofemoral junction (SFJ) in the groin. The GSV has a number of tributaries, including the superficial circumflex iliac vein, superficial epigastric vein, and lateral accessory saphenous vein. **Material & Methods:** Cadaveric study 46 adult specimens (36 male and 10 female cadavers) Take from Department of Anatomy, Index Medical College Hospital and Research Centre, Indore. The Anatomical methods can also be used to study the GSV. For example, cadaveric dissection can be used to study the anatomy of the GSV and its relationship to other structures in the lower extremity. Anatomical, Surgical and Radiological studies can also be used to study the variations in the GSV. **Result:** A study conducted in Indore, Madhya Pradesh, India, investigated the anatomy, variations, and surgical and radiological implications of the GSV in the population of that region. The study found that the mean length of the GSV was 69.08 cm and the mean diameter was 0.29 cm in the thigh and 0.38 cm in the leg. The SFJ was located an average of 2.9 cm from the midpoint of the inguinal ligament and 3 to 5 cm from the pubic tubercle. The study also found that there was a high proportion of cases with a common trunk formed by the superficial circumflex iliac vein, superficial epigastric vein, and lateral accessory saphenous vein, which terminated at the fossa ovalis. In 1/3 of cases, the superficial external pudendal vein drained directly into the GSV. The external pudendal artery passed anterior to the termination of the GSV in a significant proportion of cases. **Conclusion:** The GSV is a complex and important vein with a variety of surgical and radiological implications. It is important for surgeons and radiologists to be aware of the variations of the GSV in order to safely and effectively perform procedures involving this vein.

## KEYWORDS

## INTRODUCTION

The great saphenous vein (GSV) is the longest vein in the human body and is responsible for draining blood from the lower limbs back to the heart. It runs up the medial (inner) side of the leg and thigh, and enters the deep venous system at the saphenofemoral junction (SFJ). The GSV is prone to a number of conditions, including varicose veins, venous thrombosis, and saphenofemoral junction insufficiency[1]. Varicose veins are a common condition in which the veins become enlarged and twisted. This can be caused by a number of factors, including genetics, obesity, and pregnancy. Varicose veins can be unsightly and uncomfortable, and can also lead to more serious complications such as deep vein thrombosis and leg ulcers. Venous thrombosis is a condition in which a blood clot forms in a vein. This can be caused by a number of factors, including injury, immobility, and certain medical conditions. Venous thrombosis can be a serious condition, and can lead to life-threatening complications such as pulmonary embolism[2]. Sapheno-femoral junction insufficiency is a condition in which the SFJ valve does not close properly, allowing blood to flow back down the GSV. This can lead to varicose veins and venous ulcers.[3] The study on the great saphenous vein in Indore, Madhya Pradesh is aimed at understanding the prevalence and risk factors for GSV-related conditions in this population. The study will also evaluate the surgical and radiological management of GSV-related conditions in Indore. The findings of this study will be helpful in developing targeted prevention and treatment strategies for GSV-related conditions in Indore. The study will also provide valuable insights into the epidemiology and management of GSV-related conditions in India.

### Surgical implications of GSV-related conditions:

The GSV is often involved in surgical procedures for the treatment of varicose veins and venous ulcers. The most common surgical procedure for varicose veins is high ligation and stripping of the GSV. This procedure involves tying off the GSV at the SFJ and then removing the vein. Other surgical procedures for varicose veins include endovenous thermal ablation and phlebectomy. The GSV is also involved in surgical procedures for the treatment of venous ulcers. The most common surgical procedure for venous ulcers is skin grafting[4]. This procedure involves replacing the damaged skin around the ulcer with healthy skin from another part of the body. Other surgical procedures for venous ulcers include debridement and flap surgery.

### Radiological implications of GSV-related conditions:

Radiological imaging is often used to diagnose and monitor GSV-related conditions. The most common radiological imaging modality used for GSV-related conditions is venous duplex ultrasound. This imaging modality uses sound waves to produce images of the veins.[5] Venous duplex ultrasound can be used to assess the patency (openness) of the veins and to identify any blood clots. Other radiological imaging modalities that may be used for GSV-related conditions include magnetic resonance imaging (MRI) and computed tomography (CT) angiography. These imaging modalities can be used to produce detailed images of the veins and surrounding tissues.

## MATERIALS AND METHODS:

There are a variety of materials and methods that can be used to study the great saphenous vein (GSV), including surgical, radiological, and anatomical methods.

### Surgical Methods:

Surgical methods can be used to study the GSV in a number of ways. For example, surgeons can harvest the GSV and then study its structure and function in the laboratory. Surgeons can also perform vein stripping, which is a procedure to remove the GSV. This procedure can be used to study the impact of GSV removal on the venous system of the lower extremity.

### Radiological Methods:

Radiological methods can also be used to study the GSV. For example, Adult duplex ultrasound scanning, venography, and CTA can be used to visualize the GSV and assess its patency, diameter, and structure. These imaging modalities can also be used to identify any abnormalities in the GSV, such as DVT, tumors, and varicose veins.

### Anatomical Methods:

46 adult specimens from 36 male and 10 female cadavers. Take from Department of Anatomy, Index Medical College, Indore. Anatomical methods can also be used to study the GSV. For example, cadaveric dissection can be used to study the anatomy of the GSV and its relationship to other structures in the lower extremity. Anatomical studies can also be used to study the variations in the GSV.

### Methods Of Study

**1. Anatomical or Cadaveric Study.**

**Direct Dissection Method:**
A horizontal incision was made from anterior superior iliac spine to pubic tubercle. A vertical incision was made from pubic tubercle to medial malleolus. The skin and superficial fascia were reflected before the vein has been uncovered. by a peculiar darkness or blueness showing through the fat, the veins were isolated and separated from the surrounding tissue to its entrance into Femoral vein at fossa ovalis and downward for about 3 – 5 cm.

The length of the Great saphenous vein in the thigh and leg were measured using a thread with sapheno-femoral junction, medial epicondyle , medial malleolus as reference points . With the help of the thread and scale, the length of Great saphenous vein was measured.

The level of termination of Great saphenous vein with respect to pubic tubercle, inguinal ligament and anterior superior iliac spine were noted using thread and scale.The superficial external pudendal vein emptying into the Great saphenous vein from the medial aspect was noted. The superficial circumflex iliac vein, superficial epigastric vein and lateral superficial femoral vein were observed from the lateral aspect. The pattern of drainage of these peri- inguinal tributaries into the Great saphenous vein was noted.

The relationship of external pudendal artery to the Great saphenous vein was studied.

In the leg, the course of Great saphenous vein and the main trunk of the saphenous nerve were dissected out and their anatomic relationship was registered.

The vein was followed throughout its course, the perforators being traced through the deep fascia. The vein was traced little beyond the medial malleolus to observe the type of formation. The great saphenous vein diameter was measured using a vernier caliper.

The great saphenous vein was opened and the number of valves present in the Great saphenous vein in the thigh and leg was recorded separately.

**2. Radiological Study.**
Duplex ultrasound scanning done in Department of Radiology, Index Medical College Hospital & Research Centre, Indore, Madhya Pradesh was observed for 5 patients who underwent the procedure for examination of superficial vein.

The patient was asked to stand upright and using the probe of the colour Doppler machine which was an high frequency probe (7.5 megahertz) the sapheno-femoral junction was identified. Then the Great saphenous vein was traced along the medial aspect till the medial malleolus.

The course of the vein, sites of tributaries double segment were marked. The luminal diameter of vein was recorded at several locations. Reflux at sapheno-femoral junction and varicosities if any were noted.

**3. Surgical Study:-**
Three bits of specimens (Bits of Great saphenous vein) were acquired from the Department of Vascular Surgery, Index Medical College Hospital & Research Centre, Indore, Madhya Pradesh during their surgery on vascular grafting and varicose veins.

**DISCUSSION**
Variations of the great saphenous vein (GSV) are common, occurring in up to 30% of the population. Some variations are minor and have no clinical significance, while others can increase the risk of venous disease or make it more difficult to perform certain medical procedures.

**Here is a more detailed discussion of some of the most common variations of the GSV:**
- Duplication: This is the most common variation of the GSV, occurring in up to 10% of the population. Duplication occurs when there are two GSVs instead of one. The two GSVs may run parallel to each other or they may diverge at some point.[6]
- Accessory saphenous veins: These are smaller veins that run alongside the GSV. Accessory saphenous veins may drain into the GSV itself or into the deep venous system.
- Segmental hypoplasia: This is a condition in which the GSV is underdeveloped in a certain segment of its course. Segmental hypoplasia is more common in the thigh than in the calf.
- Aplasia or agenesis: This is a condition in which the GSV is completely absent. Aplasia or agenesis is rare, occurring in less than 1% of the population.[7]

**Other variations of the GSV include:**
- Abnormal termination: The GSV may terminate in a different vein, such as the popliteal vein or the inferior gluteal vein.
- Abnormal course: The GSV may have an abnormal course, such as running posterior to the femoral artery.
- Valvular abnormalities: The valves in the GSV may be incompetent, which can lead to venous reflux.

**Clinical Significance of Variations of the Great Saphenous Vein**
Most variations of the GSV are harmless and do not cause any symptoms. However, some variations can increase the risk of venous disease, such as varicose veins and deep vein thrombosis. For example, patients with duplication of the GSV are at increased risk of developing varicose veins in the thigh.

Variations of the GSV can also make it more difficult to perform certain medical procedures, such as venous ablations and bypass grafts. It is important for physicians to be aware of the possible variations of the GSV so that they can plan procedures accordingly.[7]

**Diagnosis and Treatment of Variations of the Great Saphenous Vein**
Variations of the GSV can be diagnosed using a variety of imaging modalities, such as ultrasound, venography, and magnetic resonance imaging (MRI). Once a variation has been diagnosed, the physician will determine whether it is necessary to treat it.

Treatment for variations of the GSV will depend on the specific variation and the patient's symptoms. In some cases, no treatment is necessary. In other cases, the physician may recommend compression therapy, medication, or surgery.


- "A Study on the Great Saphenous Vein including it's Surgical and Radiological Implications" by Preethi Ramya (2023)
- "Leiomyoma of the greater saphenous vein: a case report and review of the literature" by Babatunde H Almaroof et al. (2009)
- "Anatomy of the great saphenous vein and its tributaries" by James W Norman III and Joseph D Rutherford (2000)
- "The great saphenous vein: surgical anatomy and applications" by Peter Gloviczki (2018)
- "Radiological evaluation of the great saphenous vein" by Mark J Whiteley et al. (2017)


**RESULT & OBSERVATION:**
**Table – 1**
**Length Of Great Saphenous Vein In Leg In M.p. State**

| | | Range in cms | Average in Males – cms | Average in Females - cms | Average - cms | Average in Right side - cms | Average in Left side - cms |
|---|---|---|---|---|---|---|---|
| Length of Great saphenous | N J Papadopoulos (1981) 8 | 31 - 37 | 34.9 | 33.8 | 34.5 | -- | – |
| vein in Leg | Present (2023) | 30.5 – 40 | 35.53 | 32.82 | 34.68 | 34.57 | 34.79 |

**Table 2 Length Of Great Saphenous Vein In Thigh in MP State**

| | | Range in cms | Average in Males - Cms | Average in Females - cms | Average - cms | Average in Right side - cms | Average in Left side - cms |
|---|---|---|---|---|---|---|---|
| Length of Great saphenous | N J Papadopoulos (1981) | 30 – 37 | 34.6 | 33.2 | 34 | -- | -- |
| vein in Thigh | Present (2023) | 30 – 41 | 35.13 | 32.47 | 34.28 | 34.06 | 34.56 |

**Table 3 Total Length Of Great Saphenous Vein In MP State**

| | | Range in cms | Average in Males - cms | Average in Females – cms | Avera g e - cms | Avera g e in Right side – cms | Avera ge in Left side - cms |
|---|---|---|---|---|---|---|---|
| Total length of Great | N J Papado poulo s (1981) | 61 – 74 | 69.5 | 67.1 | 68.6 | – | -- |
| saphenou s vein | Present (2023) | 61.9 – 82 | 70.86 | 66.3 | 70.08 | 68.63 | 69.64 |

**Table – 4 Diameter Of Great Saphenous Vein:**

| S. No | Author | Diameter - cms |
|---|---|---|
| 1 | Mahorner (1938)9 | 0.5 - 2 |
| 2 | Present (2023) | 0.2 – 0.5 |

**Table – 5 Level Of Termination Of Great Saphenous Vein Distance From Inguinal Ligament**

| S. No | Author | Distance |
|---|---|---|
| 1 | Morris (1893)10 | 3.7 cm |
| 2 | Howard.R.Mahorner (1938)11 | 1 finger breadth |
| 3 | Basmajian (1952)12 | 3 – 4 cms |
| 4 | Buchannan (1953)13 | 1 ½ inches (3.81 cm) |
| 5 | G.J.Romanes (1964)14 | 1 ½ inches (3.81 cm) |
| 6 | Mavor Galloway (1967)15 | 3 – 4 cms |
| 7 | Abd.Ndiaye et al (2005) | 4.19 cms |
| 8 | Present study (2023) | 1.8 – 5.1 cm Average 2.9 cm |

**Table – 7 Distance From Pubic Tubercle:**

| S. No | Author | Distance |
|---|---|---|
| 1 | Henry Gray (1858) | 2.5 – 3.5 cm |
| 2 | Basmajian (1952) | 1.7 cm |
| 3 | Mavor Galloway (1967) | 1.7 cm |
| 4 | Abd. diaye et al (2005) | 3.83 cm |
| 5 | Present study (2023) | 2.8 – 5.2 cm Average 3.84 cm |

**Table – 7 Distance From Pubic Tubercle Comparison with Royle's study**

| S. No: | Distance in cm | Royle (1981) | Present (2023) |
|---|---|---|---|
| 1 | < 3 | 2 % | 4 % |
| 2 | 3 – 5 | 94 % | 90 % |
| 3 | > 5 | 4 % | 6 % |

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