

To study the anatomical variations at saphenofemoral junction in varicose veins



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ABSTRACT

Background: Varicose veins are a common vascular condition affecting a significant proportion of the adult population and can cause symptoms ranging from cosmetic concerns to pain, edema, and ulceration. One of the primary anatomical sites of interest in varicose vein pathology is the saphenofemoral junction (SFJ), where reflux often originates. Understanding the anatomical variations of the SFJ is crucial for accurate diagnosis, effective surgical intervention, and minimizing post-operative recurrence. Duplex ultrasonography is a key diagnostic tool for assessing venous competence and identifying anatomical variations, but discrepancies between pre-operative imaging and intraoperative findings can impact surgical outcomes.

Aims and Objectives: This study aims to investigate the anatomical variations at the SFJ, compare pre-operative duplex ultrasonography findings with intraoperative observations, and examine variations in tributaries in patients with primary varicose veins. **Materials and Methods:** A prospective study was conducted with 50 patients undergoing surgery for varicose veins. Clinical examinations and venous duplex ultrasound (USG) were used to assess the location and condition of the SFJ, with findings being compared to intraoperative results. **Results:** Results showed that SFJ was found to be incompetent in all patients, with 52% having superficial vein incompetence saphenopopliteal junction and 94% displaying perforator incompetence. The mean location of SFJ was found to be 2.5 cm inferior and 3.6 cm lateral to the pubic tubercle on pre-operative duplex USG, with similar findings observed intraoperatively (2.6 cm inferior, 3.7 cm lateral). The number of tributaries ranged from 1 to 5, with a mean of 3.04 tributaries. External pudendal artery was found posterior to SFJ in 90% of patients. **Conclusion:** The study highlights that pre-operative duplex USG is accurate in locating the SFJ and that a precise understanding of anatomical variations at the SFJ is essential to reduce recurrence of varicose veins. This research underlines the importance of identifying all tributaries and variations during surgery to ensure complete ligation and successful outcomes.

Key words: Varicose veins; Saphenofemoral junction; Duplex ultrasonography; Anatomical variations; Recurrence

INTRODUCTION

Varicose veins are dilated subcutaneous veins in the lower limbs, measuring ≥ 3 mm in diameter when assessed in an upright position with demonstrable reflux.¹ Patients commonly present with symptoms such as aching-especially while standing-itching, night cramps, skin pigmentation,

ulceration, eczema, restless legs, and ankle swelling.² The evaluation of varicose veins involves both clinical and radiological assessments. Common clinical tests include the Trendelenburg test, tourniquet test, Perthes test, Fegan's test, Pratt's test, and Schwartz's test.³ Radiologically, Doppler or duplex ultrasound (USG) is used to assess venous reflux and valve competence. The clinical-etiology-anatomy-

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pathophysiology (CEAP) classification system categorizes varicose veins based on four parameters: C, E, A, and P. Duplex ultrasonography provides comprehensive evaluation by visualizing both the anatomical structure and functional aspects of the venous system, including perforating veins. This imaging modality accurately determines the location and extent of valvular incompetence (Figure 1). In addition, a Doppler flow probe can be employed to assess vein patency and exclude arterial disease.⁴ It can also identify the origin of venous reflux and detect thrombus in cases of suspected deep vein thrombosis.⁵ Surgical treatment of varicose veins primarily aims to eliminate the source of venous reflux and remove incompetent veins. This usually involves ligating the saphenofemoral junction (SFJ) or the saphenopopliteal junction (SPJ), as well as excising the affected saphenous trunks and associated varices.⁶ The SFJ must be tied flush with the femoral vein, and all tributaries within 1 cm above and below the junction should be ligated and divided.⁷ Surgical interventions typically include high ligation, vein stripping, and the excision of dilated varices.⁸ Thorough removal of varices and proper ligation of tributaries and perforating veins at the point, where they traverse the deep fascia are essential to prevent recurrence.⁹ Anatomical variations in the venous system of the lower limbs are most prominent at the SFJ. This junction is usually located approximately 2.5 cm inferior and 4 cm lateral to the pubic tubercle. Understanding the anatomical variations of the SFJ and the tributaries of the great saphenous vein (GSV) is crucial for successful surgery and to minimize the risk of varicose vein recurrence following the procedure. The present study was undertaken to note the accurate location of SFJ. The present study was undertaken to note the accurate location of SFJ, compare the accuracy of pre-operative duplex ultrasonography with intraoperative findings and to record variations in tributaries at surgery in patients with primary varicose veins of the lower limb. This study also assessed variations in SFJ.

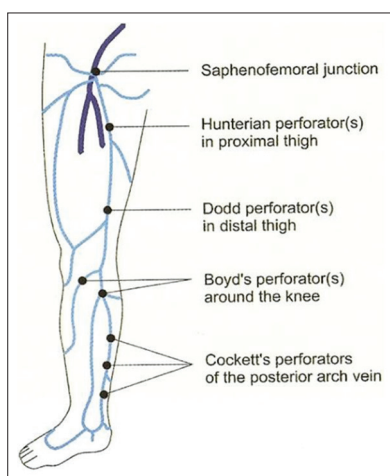


Figure 1: Anatomy of saphenofemoral junction in lower

Aims and objectives

This study aims to investigate the anatomical variations at the saphenofemoral junction (SFJ), compare preoperative duplex ultrasonography findings with intraoperative observations, and examine variations in tributaries in patients with primary varicose veins.

MATERIALS AND METHODS

Study design

This was a prospective, non-randomized study which examined anatomical variations at the SFJ. All patients with varicose veins and SFJ incompetence were included in the study. Patients with deep vein thrombosis were excluded from the study.

Procedure

This study was conducted in 50 patients of varicose veins presenting to the surgery Outpatient Department (OPD) at PGIMS, Rohtak, undergoing surgery for varicose veins. The informed consent was taken from all patients who participated in the study. In all the patients, a detailed history was taken including the history of duration of symptoms such as pain, swelling, and any skin changes and ulceration in lower limbs with special focus on risk factors. Clinical tests such as Trendelenburg test, tourniquet test, Perthes test (Modified), Fegan's method, Pratt's test, and Schwartz's test were done. Routine laboratory investigations were done in all the patients. The clinical severity of disease in a given patient was assessed by Standard CEAP classification as recommended by society for vascular surgery. Diagnosis of varicose veins was established by clinical examination and further confirmed by venous duplex USG. The SFJ was marked in lower limbs using Siemens Medical Solutions USA, Inc. duplex USG scan system with linear probe KT-LM 200 HDPE/5-2 MHz (lower frequency) and linear probe HFL38/13-6 MHz (high frequency). All the patients underwent Trendelenburg's procedure, stripping of GSV in the thigh portion, multiple ligation of dilated veins, and subfascial ligation of perforators. All patients were operated in the surgery operation theater. The type of anesthesia (general/spinal) to be used was left to the discretion of the attending anesthesiologist.

Dissection of SFJ was carried out with an incision in the groin 1 cm below and 2 cm lateral to the pubic tubercle with its center over SFJ. The incision was carried down through the subcutaneous tissues and GSV was identified. SFJ was identified and the exact location of SFJ was measured with reference to the pubic tubercle with the help of measuring scale (Figure 2). The number and name of tributaries were noted within the first 5 cm from SFJ. High ligation of SFJ with ligation of all the tributaries with the

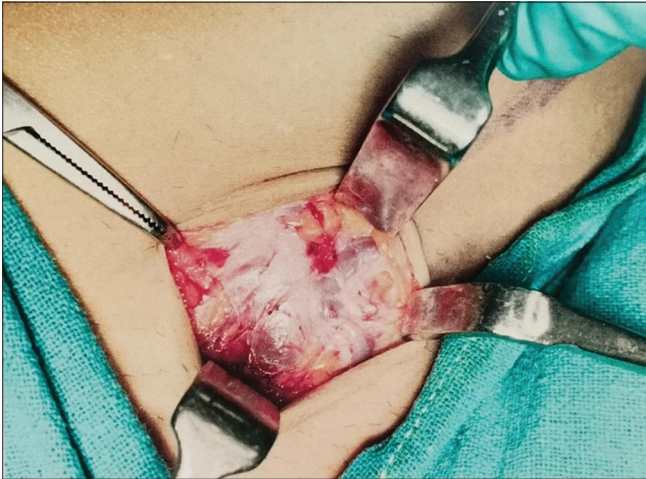


Figure 2: Saphenofemoral junction after dissection

stripping of the thigh portion of the long saphenous vein was done. Superficial phlebectomy was done for prominent superficial veins in the leg. All the perforators marked by duplex USG were ligated subfascially by giving subfascial incision at the marked site. The presence or absence of external pudendal artery (EPA) at SFJ and its relationship to the SFJ were recorded.

Statistical analysis

Descriptive statistics were calculated by measuring mean, standard deviation (SD), and proportions with a 95% confidence interval for reliability. Inferential statistics were scored using analysis of variance and Chi-square test (to compare independent proportions). Paired t-test was used to compare two methods of identifying SFJ distance from the pubic tubercle. $P < 0.05$ was considered statistically significant. Graphic presentation was done using Microsoft Excel.

RESULTS

The study was conducted on 50 patients of varicose veins presenting in OPD of Surgery of PGIMS, Rohtak. These patients underwent pre-operative duplex USG and varicose vein surgery. In our study, the maximum number of patients, i.e., 28 out of 50 belong to the age group 21–40 years of age. The youngest patient being 16 years old and the oldest was 64 years old. In the present study, there were 35 males and 15 females, varicose veins were more commonly seen in males than females. The left lower limb in 29 patients was involved more commonly than the right side lower limb in 19 patients. Two patients had bilateral varicose veins. Dilated veins were the most common presenting symptom in all 50 patients followed by pain and discomfort in 21 patients. Maximum number of patients presented with C2 severity in 72% of patients. In our

study, SFJ was found to be incompetent in all 50 patients, SPJ was incompetent in 52% of patients, perforators were incompetent in 94% of patients, and deep veins were found to be normal in all 50 patients.

On duplex USG, SFJ was located at a mean of 2.5 ± 0.39 cm inferior and 3.6 ± 0.35 cm lateral to the pubic tubercle. It was located at a mean of 2.6 ± 0.5 cm inferior and 3.7 ± 0.42 cm lateral to pubic tubercle intraoperatively. The difference (Z i.e. the Z score) was found to be insignificant as P-value was more than 0.05. The number of tributaries ranged from 1 to 5 within the first 5 cm from SFJ. The mean number of tributaries was 3.04 and SD was 0.57. There was a minimum of one tributary and maximum number of five tributaries. Superficial circumflex iliac vein was found in 94% of patients, followed by superficial inferior epigastric vein in 86%, superficial external pudendal vein in 84%, and anterolateral branch in 38% of patients. EPA was found to be posterior to SFJ in 45 patients and EPA was found to be crossing SFJ in 5 patients.

DISCUSSION

Among various venous anatomical variations in lower limbs, the most important and significant variations in lower limbs occur at SFJ. The junction is identified by the commonly used surface marking which usually lies 2.5 cm inferior and 4 cm lateral to pubic tubercle. A complete knowledge about anatomical variations at SFJ and variations in tributaries of GSV is important during surgery and ensuring that the junction is safely managed in least aggressive and most effective way.

The present study was undertaken to note the accurate location of SFJ and compare the accuracy of pre-operative duplex ultrasonography with intraoperative findings and to record variations in tributaries at surgery, in patients with primary varicose veins of the lower limb. This study also assessed variation in SFJ.

In our study, patients with severity ranging from C2 to C6 (CEAP) scores were taken. Out of 50 patients, 36 patients (72%) presented with C2 severity, 8 patients (16%) presented with C3 severity, and 5 patients (10%) presented with C4 severity. One patient presented with C6 severity (2%) of disease. The maximum number of patients (76%) belongs to C2 severity in the present study. Allegra et al. in their study involving 1326 limbs had 68.5% of patients in C1-C3 severity and 31.5% for C4-C6 severity of varicose veins.

In our study, the location of SFJ was a mean of 2.5 ± 0.39 cm inferior and 3.6 ± 0.35 cm lateral to pubic tubercle on duplex

USG. SFJ was 2.6 ± 0.5 cm inferior and 3.7 ± 0.42 cm lateral to the pubic tubercle on operative exploration. The difference was found to be insignificant as P-value was more than 0.05. Manerikar et al. showed that SFJ was located 2.24 ± 0.55 cm inferior and 3.77 ± 0.61 cm lateral to the pubic tubercle on duplex USG done preoperatively and postoperatively, it was found to be 2.35 ± 0.42 cm inferior and 3.73 ± 0.58 cm lateral to the pubic tubercle, respectively.¹⁰

In our study, the number of tributaries ranged from 1 to 5 at first 5 cm from SFJ. The mean number of tributaries was 3.04 with SD of 0.57. There was a minimum of one tributary and maximum of 5 tributaries in 40 patients (80%) and 4 tributaries in 7 patients (14%). According to the study of Donnelly et al., number of tributaries varied from 1 to 10.¹¹ In another study done by Vaz et al., in 189 patients, it ranged from 1 to 7.¹² Therefore, one should make concentrated efforts to locate all tributaries precisely so as not to miss any which may cause recurrence. The most frequent number of tributaries was 3 (42%) in the study of Manerikar et al. who had similar findings of three tributaries (57.4%) in the study.¹⁰ In the study of Hemmati et al. on 228 participants, the most common frequency of tributaries was 4.¹³ The study of Manerikar et al. showed that superficial inferior epigastric vein was the most common and consistent tributary of SFJ which was seen in 98% followed by superficial circumflex iliac vein (92%).¹⁰

In the present study, a diligent search for EPA was made during all surgical explorations, and its relation to SFJ was recorded. It was found that EPA was found to be posterior to SFJ in 45 patients (90%). EPA was found to be crossing SFJ in 5 patients (5%). To avoid inadvertent injury to EPA resulting in arterial bleeding, deliberate search for the same must be made; hence, knowledge of its location and variation will be useful.

A study by Riju showed that in 72 out of 80, i.e. 90% of cases, they were clearly able to demonstrate the EPA between the low-speed vehicle (LSV) and the common femoral vein in the fossa ovalis and it was a very good landmark of the SFJ. They also identified two cases where the EPA was found to traverse anterior to LSV exactly at the SF junction. Donnelly et al. showed that reliance on the EPA to identify the SFJ was potentially misleading as it was identified in 22.5% of cases only and they concluded that the presence of EPA is an indication of anatomical variant and not a landmark for SFJ.¹¹

Limitations of the study

The study was conducted in a single center and hence was limited in terms of diversity of the population involved.

Also, the study was conducted on only 50 patients. Making the study multi-centric and including people from diverse regions can provide more insights which may be more suitable for the global population.

CONCLUSION

In the present study, we concluded that the difference in the location of SFJ in relation to the pubic tubercle on pre-operative duplex USG and intraoperatively was insignificant. As a result, the accuracy of pre-operative duplex USG with the intraoperative findings on the variations in SFJ was shown to be almost the same. It also showed that the number of tributaries of SFJ showed significant variations on surgical exploration. EPA was found to be posterior to SFJ in the majority of the patients in the study.

Having precise knowledge of the normal anatomy and its variations while performing surgery is vital as recurrent varicose veins post-surgery is a common problem which may be attributed to causes such as inadequate assessment and anatomical variations at SFJ. In addition, incomplete surgery resulting from improper marking by pre-operative duplex USG may lead to incomplete ligation of all branches of SFJ which in turn would lead to recurrence of varicose veins. Furthermore, pre-operative, marking of SFJ by duplex USG would help in the precise planning of the incision.

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