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Research Article

Retrospective Study to Evaluate the Anatomical variation in Proximal Branches of Great Saphenous Vein at SF Junction Encountered During Surgery for Varicose Vein

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ABSTRACT:

Background The Venous drainage of lower limb consists of Superficial and Deep venous system and the Perforators. Incompetence of valves in these veins lead to varicosities which needs surgery in form of Stripping of great saphenous vein and ligation of perforator in thigh and leg. Anatomy of lower limb veins need to be well known before proceeding for any kind of reflux surgery as there is high incidence of re-occurrence reflex if any of branches are left.

Method: This was a retrospective study conducted in department of Patna medical college and hospital where data was collected from prior records of patient who were operated upon for varicose vein surgery where exploration of sapheno -femoral junction was done along with ligation of all its branches. During which anatomical variation in site and number of great saphenous vein branches in proximal thigh were noted. Records of 126 patient were collected and data analysed for period of 1 year from April 2023 to March 2024.

Result: Most of the patient were middle age overweight/obese female with stage three varicose vein (CEAP classification) and had on average 3-5 branches in proximal thigh.

Conclusion: Anatomical variations in branches at the GSV proximal part are common. While surgery remains an effective and feasible treatment option for varicose vein patient CVD

patients, it is recommended to explore the location of varicose veins precisely to ensure the appropriate surgical technique. The average number of GSV tributaries was about 3-5.

Keywords: Varicose; Incompetence; SF Junction; Saphenous Vein

Introduction:

The Venous drainage of lower limb consists of Superficial venous system (Great Saphenous Vein and Short Saphenous Vein) and Deep venous system (Tibial, Peroneal, Popliteal and Femoral veins) and the Perforator veins connecting superficial venous system to deep venous system. The venous system carry blood from tissue and organs, allowing a return to the heart. Valve system that segments the blood column[1]are present in these veins Valves help in unidirectional flow of blood towards heart and preventing reflux into superficial venous system and maintain a net vertically directed flow. Valves divide the hydrostatic column of blood into segments and thus prevent the full hydrostatic pressure of the fluid column from exerting force on the distal veins [2]. Valve incompetence due to degeneration, absence or destruction leads to venous reflux commonly known as varicosities in the lower limbs. With progression, varicose dilatations occur. The incidence of varicose veins is approximately 2% per year and the prevalence is higher in Western countries. Varicosities are common in lower limbs with wide spectrum of disease variation in form of telangiectasia, varicosity, edema, lipodermatosclerotic skin changes, reticular vein, healed and active ulceration. Initially for mild symptoms treatment is conservative. Conservative measures like compression stockings. Diosmin has proven to show some benefits. They provide relief and may halt the disease progression. However, curative treatment is surgical in form of Trendelenberg operation- Ligation of branches of great saphenous vein along with Stripping of great saphenous vein and ligation of perforator in thigh and leg. Laser ablation is now a days done routinely if facilities are available. Stripping operations and the less invasive endogenous ablation have shown comparable results in saphenous vein insufficiency treatment. Other surgical and interventional methods are cryostripping, endovenous laser or radiofrequency ablation, microwave or mechano-chemical ablation, Vena Seal (cyanoacrylate adhesive closure), foam sclerotherapy, and others. Anatomy of leg veins need to be well known before proceeding for any kind of reflux surgery as there is high incidence of reflex if any of branches are left. GSV is the longest vein in the human body, arises from the medial aspects of the dorsal venous arch, and enters into the femoral vein just below the inguinal ligament. The GSV is often accompanied by tributaries, and at times, the tributaries can be confused with the GSV or be mistaken for GSV duplication. Its main

branches that are seen[1].Superficial circumflex iliac vein[2]. superficial epigastric vein3. Superficial external pudendal veins. Along with these there are multiple perforators which communicate superficial veins to deep veins and have role in varicose veins. Some perforators are fairly constant in position: lateral ankle perforators, Medial ankle perforators, Posteroinferior to medial malleolus and 10 cm above medial malleolus and 15 cm above med. malleolus, Gastrocnemius perforators of Boyd around knee, Mid-thigh perforators of Dodd and Hunter's perforator in thigh[3].

Materials and Methods

This was a retrospective study conducted in department of patna medical college and hospital where data was collected from prior records of patient who were operated upon for varicose vein surgery where exploration of sapheno -femoral junction was done along with ligation of all its branches. During which anatomical variation in site and number of great saphenous vein branches in proximal thigh were noted. Records of 126 patient were collected and data analysed for period of 1 year from april 2023 to March 2024.Preoperative colour Doppler were done in all case and marking were made prior to surgery and operation performed, stripping of GSV and ligation of all its branches and multiple perforator ligation in thigh and leg was done.

Data Collection: Age, gender, demographic profile, rural/urban background, body weight, stage of varicosity according to CEAP classification was noted, intraoperative notes were recorded were surgical procedure type performed and no. of GSV branches at sf junction or proximal thigh that were ligated intraoperatively were noted. Data recorded and analysed.

I**nclusion Criteria**

- All patient age 18-55 years who were operated for varicose vein surgery

Exclusion Criteria

- Patient who was prior operated
- Patient requiring endovenous procedure
- Patient who had associated aneurysmal leg lesions

Statistical Analysis: The results were analysed using t Chi square test and a p-value < 0.05 was obtained which was statistically significant.

Results

Mean age: 46

Gender: female> male

Social status – urban > rural Mean weight > 60 kg

Ceap Classification stage-3 -varicose vein commonest

Number of Tributaries

No. tributaries	5%
<3 tributaries	25%
3–5 tributaries	62%
5 tributaries	8%

Superficial external pudendal vein	96.8%
Superficial epigastric vein	92.2%
Superficial circumflex iliac vein	51.7%
Deep external pudendal vein	39.6%
Posteromedial thigh branch	34.6%
Anterolateral thigh branch	26.4%
Medial accesory saphenous vein	4.6%
Anterior accessory great saphenous vein	12%

Discussion

Significant variations exist in anatomy of GSV proximal part. The intraoperative anatomy of the sapheno-femoral junction varies. Various studies describe 3-6 proximal tributaries: three medial—the superficial external pudendal, the deep external pudendal, and the posteromedial thigh branch—and three laterals—the superficial epigastric, the superficial circumflex iliac, and the anterolateral thigh branch. Episodes of recurrence of varicose veins due to inadequate surgery with failure to identify and ligate all the tributaries. Thorough examination of SF junction can reduce recurrence rates following surgery. The GSV is often accompanied by its tributaries, and at times, the tributaries can be confused with the GSV or be mistaken for GSV duplication. Anterior accessory great saphenous veins (AAGSVs), tributaries of the great

saphenous vein, may be important in the pathophysiology of chronic venous disease. Studies establish that the frequency of isolated reflux in the AAGSV is much higher than described in the previous literature data. It was established that its frequency was 12.06%, similar to more recent data[3].The number of tributaries encountered in the proximal part of GSV may vary. Our study revealed, that, in most of the cases between three and five tributaries were encountered. It requires particular attention during surgery. Long-term trials have uncovered variable recurrence rate after varicose vein surgery. There is much debate about whether this is the result of the dilatation of existing tributaries in the groin, their distribution (some papers suggest that branches arising from the abdominal wall are less likely to cause recurrence), or the growth of new veins as a result of the angiogenesis that follows surgical treatment and healing (neovascularization). Considering this data, in open surgery, it is recommended to close all the tributaries, if possible, in order to prevent further recurrence [5-7]. Less than three tributaries were observed in 25% of cases, the superficial external pudendal vein or the superficial epigastric vein frequently ,while more than five tributaries were observed in a small percentage of cases 8% similar to other published data [3,4]. This anatomical variation needs carefully performed dissection, with the isolation of each tributary vessel and their subsequently ligation, in order to prevent vessel avulsion during the stripping procedure , with secondary haemorrhage and further complications. The most peculiar case encountered in this study was the “no tributaries” patient a very rare anatomical variation [3]. Despite the fact that these kinds of cases are very rarely encountered, they can raise particular intraoperative concerns, especially if they lead to confusion between the great saphenous vein and the femoral vein. Femoral vein ligation and sectioning is an accident resulting from the surgeon’s mistake, which can lead to dramatic complications. This rare anatomical peculiarity is intraoperatively encountered, in order to avoid femoral vein injury, a thorough dissection of the saphenofemoral junction is required in order to determine the GSV entrance into the femoral vein. Additionally, we must always take into account the suprafascial anatomical position of the GSV. Further, GSV laser crossectomy is a less invasive procedure, which has been proven to be a safe and feasible approach and considerably reduces the risk of femoral vein damage. In some of the patients analyzed in this study, proximal GSV aneurysms were encountered. Venous aneurysm can be defined as a persistent isolated dilatation two to three times larger than the normal diameter of the vein[8], with the diameter of a healthy great saphenous vein usually ranging from 2.5 to 6 mm. Venous aneurysm development is considered to be the result of the congenital absence of smooth

muscle in the venous tunica media, associated with small amounts of elastin fibers and smooth muscle cells, fibrous connective tissue, and elastic fibers in the venous wall. Venous aneurysms (VAs) have been described in almost all of the major veins 8, and there are literature data that claim that VAs is not so rare [10]. In clinical practice, VAs can raise concerns from both differential diagnosis and therapeutic approach points of view. The main differential diagnosis, which should be considered, comprises primary venous aneurysms and arterial aneurysms, whose treatment is completely different[9]. Considering the therapeutic approach, despite the fact that 1560 nm wavelength lasers show safety and efficacy in the treatment of patients with a wide diameter of the proximal segment of the great saphenous vein, endovenous laser ablation has to be personalized, according to the size of the segments of vein in these patients. However, considering the risk factors for recanalization and ablation failures, in GSV aneurysms, open surgery remains a feasible approach and, in most cases, should be recommended. Surgery remains the gold standard of care in patients with varicose veins; however, several newer interventions have been recently introduced, which need to be evaluated. During standard surgery, it is imperative to demonstrate and ligate the tributaries of the saphenofemoral junction in combination with stripping of the great saphenous vein. In addressing the challenges presented by GSV anatomical variations, it is evident that a thorough preoperative assessment is essential. Techniques such as vascular ultrasound allow for a detailed visualization of the vein's course, facilitating the identification of variants that may impact the surgical approach. The recognition of these variations not only aids in avoiding potential complications during surgery but also in tailoring treatment strategies that accommodate individual anatomical differences, thereby enhancing patient outcomes. In sum, our study's findings are corroborated by and contribute to the existing published literature related to the clinical and surgical implications of GSV anatomical variations. By drawing comparisons with previous studies, we underscore the necessity of personalized treatment approaches, informed by advanced diagnostic techniques, to navigate the complexities of the venous anatomy and improve surgical outcomes for patients with CVD. Future research should continue to explore the nuanced relationships between anatomical variations, surgical techniques, and patient outcomes, further enriching our understanding of optimal CVD management strategies. Despite the fact that this study brought valuable scientific information regarding GSV proximal part anatomical variations and their implications in saphenofemoral junction reflux surgery, some study limitations should be discussed. The limitations include the retrospective nature of

the study and the fact that, because we do not have a long-term follow-up for all the enrolled patients, we cannot present a report considering the implications of the anatomical variations in the recurrence occurrence. Medium- and long-term follow-up of the patients is considered as a future research direction, in order to establish potential correlations between the anatomical variations and venous reflux recurrence. In addition, we are considering a future prospective study in order to assess ultrasonographically the GSV anatomy in a healthy population, to establish whether certain anatomical variations can be related to CVD development over time.

Conclusions

Anatomical variations in branches at the GSV proximal part are common. While surgery remains an effective and feasible treatment option for varicose vein patient CVD patients, it is recommended to explore the location of varicose veins precisely to ensure the appropriate surgical technique. The average number of GSV tributaries was about four, and the most commonly observed branch was the superficial external pudendal vein; however, a complex array of anatomical variations can be also encountered. In conclusion, the anatomical variations in the GSV represent a critical area of study within the field of phlebology, with significant implications for the clinical management and surgical treatment of venous disorders. A comprehensive understanding of these variations, combined with advanced. Imaging techniques and tailored surgical approaches, will continue to play a pivotal role in improving patient care and outcomes in venous disease treatment.

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