A complete duplication of the right and a segmental duplication of the left great saphenous vein - a case report

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Abstract

Abnormalities of the lower limb veins lead to venous disorders such as obstructive or the ones associated with venous insufficiency. Varicose veins, deep vein thrombosis and ulcers are the common disorders. As many variations are noted in veins in comparison to arteries, the present case report expresses the need for a detailed evaluation of the veins of the lower limb. During the routine dissection of a 65 year old male cadaver, a complete duplication of the Great Saphenous vein (GSV) was noted from the medial malleolus of the tibia till the saphenofemoral junction in the right lower limb and a segmental duplication was noted in the thigh region of left lower limb. Such findings would be of great value to surgeons, orthopaedicians and interventional radiologists as iatrogenic varicosity can be prevented and for cardiovascular surgeons who can use the duplicated vein as vascular grafts in cases of Ischemia and arterial blocks.

Key Words: Varicose veins, double pattern of veins

Introduction

The lower limbs show the presence of superficial and deep venous systems. Their abnormalities lead to the one of the most common disorders which is varicose veins. Varicose veins have shown an incidence of 15% and 25% in male and female categories of both Western and Indian population. The superficial veins are found to lie in subcutaneous tissue and comprise the Great Saphenous Vein (GSV), Small Saphenous Vein (SSV) and their tributaries. In thigh, GSV with saphenous nerve lies in saphenous compartment, which has the saphenous fascia superficially and in the deep lays the muscular fascia.

GSV starts distally as a continuation of medial marginal vein of foot, ascends anterior to tibial malleolus, crosses distal third of medial surface of tibia obliquely to reach its medial border and ascends a little behind the border to the knee. Proximally it is posteromedial to the medial tibial condyle and continues to ascend on medial aspect of thigh. It then passes through the saphenous opening which is 2.5 to 3.5 cm inferolateral to pubic tubercle and finally drains into femoral vein. It communicates with SSV as well as the deep anterior and posterior tibial veins through perforating branches. In thigh it receives many tributaries from superficial veins of medial and posterior compartments. Prior to entering the saphenous opening, GSV receives three tributaries namely the superficial epigastric, the superficial circumflex iliac and the superficial external pudendal veins.

Developmentally the GSV originates from posterior cardinal vein. As limited literature is available on the embryological aspect of duplication of saphenous vein, it can be claimed to be a mild condition of truncular venous malformation. The defective developments like aplasia, hypoplasia or hyperplasia of venous system are yet to be assessed as the cause for duplication but any aberrant outcome during venous trunk formation, in the process of evolution and involution during the last stage of embryogenesis (the truncular stage), could lead to such variations. No clear data is there to support the role of genetic factor for the venous trunk duplication, but vascular malformations have shown an increased evidence of genetic defects of familial and sporadic types to be its pathogenesis.
The current report describes a complete double GSV in right lower limb and segmental duplication in left thigh region. As the GSV is described to always be a single trunk, a missed duplication sees recurrence of varicosity even after successful surgery.

Case report

During the routine dissection in Anatomy Dept. at Sri Muthukumaran Medical College, a rare case of complete duplication of Great Saphenous Vein in right lower limb and a segmental duplication in left thigh region was observed in a 65 year male cadaver fixed in 10% formalin. The dissection was carried out as per the 15th edition of Cunningham’s Manual of Practical Anatomy, Vol-1 and the variations were photographed (Fig 1).

Fig 1: Complete duplication of the right Great Saphenous Vein (GSV) and segmental duplication of the left GSV.

Fig 2: Duplication of the right GSV at the right ankle and single trunk of left GSV.

Fig 3: Two trunks (GSV1 & GSV 2) of the right duplicated GSV.

Fig 4: Segmental duplication of the left GSV.
Observations

1) At the foot region

In both lower limbs, the Great Saphenous Vein (GSV) originated as a continuation from dorsal venous arch. No variation was noted in this region.

2) At the ankle region.

At the medial malleolus of the right tibia, the right GSV showed its duplication. The two trunks were closely associated and continued as duplicated trunks in leg region. No variation was noted in left GSV (Fig 2).

3) At the leg region

The two trunks of right duplicated GSV were situated close to each other and they continued with their anatomical course. In left lower limb, the left GSV continued as a single vein.

4) At the thigh region

The duplicated right GSV continued its normal anatomical course and two divisions joined at the saphenous opening which was located 4 cms lateral to pubic tubercle and then drained into the femoral vein (Fig 3). In left lower limb, left GSV showed its duplication 2.5cm above medial aspect of left knee joint till mid-thigh level after which the two divisions joined to form a single tributary and after passing through the saphenous opening, it joined femoral vein. The proximal union of the segmental duplication of the left GSV was 20cm inferior to pubic tubercle (Fig 4).

Rest of the veins of lower limbs were normal and perforating channels communicated with medial division of both the GSV.

Discussion

The incidence of double Great Saphenous Vein (GSV) ranges from 1% to 86% in different studies. As clear definitions and objective parameters for identification of the variations are lacking, variable incidences of duplication of GSV have been reported by way of Duplex examination, anatomical dissection and phlebography methods.

In dissected specimens, Allan et al observed a looped duplicated GSV in 18% cases and Donnelly et al study observed duplication in 9% cases, while in a post-mortem anatomical study by Kaiser et al, duplication was noted to be 25%. By Duplex examination, Ruoff et al reported duplication in 18% cases and van Dijk et al noted the duplication in 20%. By phlebography, Shah et al observed duplication in 35% cases and Corrales observed it to be in 59% cases. These patterns of duplication were partial and occurred at various levels in GSV course. The present case showed a left segmental GSV duplication which was 4cms above the medial aspect of left knee joint till mid-thigh region after which it united to form a single trunk. This pattern is called as a closed loop pattern of duplication.

According to Ricci et al, a true duplication of GSV is extremely rare and occurs when two trunks run parallel to each other within the saphenous compartment. Large tributaries running parallel to GSV do not comprise of true duplication, but may act as a functional double vein. True duplication was 1% in Ricci et al study. According to Corrales et al, the incidence was 0.97% with male preponderance, while the study by Kockaert et al which was a retrospective and prospective duplex examination, showed the incidence to be 1.8% and Talalwah et al noted true duplication in 1.3% cases. This present case reports a true duplication of the right GSV in a male cadaver where the two trunks unite at the entrance of the saphenous opening and it receives its superficial tributaries and then finally drains into the right femoral vein.

The GSV has a role as an auto graft for arterial bypass surgery like in femoropopliteal surgeries. Hence a proper understanding of anatomy of superficial veins is elementary. A non-invasive Duplex examination of veins could be of great help to observe any variations. A pre-operative invasive test like Phlebography also shows variations and connections of the veins. This test is a useful technique to identify veins that will be
unsuitable for a femoropopliteal bypass and thereby save an unnecessary dissection. A persistent trunk leads to varicose veins and so an assessment of duplicated veins and their perforators are necessary to prevent failure of a varicose vein surgery which can be done by Duplex or Phlebography tests.

Glasser dissected 100 lower limbs and noted variations of the tributaries of the GSV at the saphenofemoral junction. He reported 19 different saphenous -femoral drainage patterns at the fossa ovalis (saphenous opening). In his study, an incidence of 3% was observed, wherein a double GSV joined at the fossa ovalis. This present case also reports the same double pattern on right side lower limb where the two trunks join at the saphenous opening and then drain into the femoral vein.

Darke et al and Stone Bridge et al respectively noted 30% and 40% of recurrent varicose veins to occur due to thigh perforating veins. This recurrence occurs when the perforators open into the non-dominant branch and as their calibre is small, they cannot be stripped easily. For arterial grafts, calibre of duplicated vein is also important as hypoplasia will alter graft anatomic model.

Treatments options include a conservative therapy, sclerotherapy, phlebectomy, endovenous laser therapy, radiofrequency ablation, and surgery involving saphenous ligation and stripping. Expertise in venous anatomy is necessary especially for interventional treatment modalities in cases of varicose veins and their use as arterial autografts. Hence if important anatomical variations are not recognised, surgical or less invasive procedures may result in incomplete surgeries.

**Conclusion**

The knowledge and identification of anatomical variations brings better success and efficacy of surgeries in varicose veins with decrease in their recurrence rate. A duplicated vein can be used as a graft for various vascular anastomoses. More clinical awareness helps to prevent iatrogenic varicose veins. A simple, precise and consistent anatomical terminology would help in defining various patterns of anomalies. Studies focusing on different segments of veins, their communicating channels and calibration are required to have detailed anatomical knowledge since great variability pattern is noted in the venous system of the lower limbs.

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