SAGE Open Medical Case Reports
Volume 5: 1–5

DOI: 10.1177/2050313X17692937
journals.sagepub.com/home/sco
SAGE

A failure of preoperative duplex imaging to diagnose a lower extremity venous aneurysm in a patient with severe chronic venous insufficiency

Roy Wesley Jones, Godfrey Ross Parkerson, Mary Ottinger, Eduardo Rodriguez and Brian Park

Abstract

Objective: We present a case of recurrent bilateral lower extremity venous stasis ulcers in association with a superficial venous aneurysm at the right saphenofemoral junction that was misdiagnosed on preoperative duplex scanning.

Methods: A 53-year-old female presented to our clinic with 6-year history of bilateral lower extremity venous stasis ulcers. Her past medical history was significant for refractory venous stasis ulcers of the bilateral lower extremities present for 6 years and morbid obesity.

Results: Preoperative venous duplex demonstrated severe venous insufficiency of the superficial and deep systems, but a venous aneurysm was not appreciated. During the high ligation of the right saphenofemoral junction, a 3 × 4 × 5 cm aneurysm was encountered. Repair consisted of aneurysm resection, high ligation of the greater saphenous vein, dissociation of the great saphenous and anterior saphenous veins, and stab phlebectomy of large varicose veins of the thigh and lower leg. The patient recovered uneventfully and experienced complete healing of the venous stasis ulcer in several weeks.

Conclusion: Superficial venous aneurysms of the lower extremity are rare and can be often missed on preoperative duplex ultrasound imaging. Large diameter measurements of the proximal greater saphenous vein and obesity increase the risk of misdiagnosing venous aneurysms with duplex imaging; therefore, clinical suspicion must remain high. These aneurysms can be associated with significant symptoms for which repair is indicated.

Keywords

Superficial venous aneurysm, venous aneurysm, chronic venous insufficiency, venous stasis ulcers, duplex ultrasound

Date received: 5 August 2016; accepted: 10 January 2017

Background

Venous aneurysms of the lower extremity are uncommon clinical entities. The commonly cited definition of venous aneurysm is a dilation of a venous segment to 1.5 times the diameter of the unaffected adjacent proximal and distal segments of the vein.[1] Venous aneurysms in the lower extremity can involve either the deep or superficial veins. The deep veins of the lower extremity are located within the fascial muscle compartments and include the femoral vein (previously named the superficial femoral vein), deep femoral vein, popliteal vein, and all three tibial veins, while the superficial veins lie above the muscular fascia and include the great saphenous vein (GSV), the small vein, and the anterior and posterior accessory veins.[2] Deep venous aneurysms are associated with an increased risk of deep venous thrombosis with thromboembolism causing pulmonary embolism (PE) and are generally recommended to be repaired due to these risks.[1,3,4] Superficial venous aneurysms also present a risk for thromboembolism, however to a much lesser degree, and are more commonly associated with symptoms of venous

Division of Vascular Surgery, USF Health Morsani College of Medicine, Tampa, FL, USA

Corresponding Author:
Roy Wesley Jones, Division of Vascular Surgery, USF Health Morsani College of Medicine, 2 Tampa General Circle, Tampa, FL 33603, USA.
Email: rwjones@health.usf.edu

insufficiency such as pain, swelling, and skin changes.[1] Historically, repair of superficial venous aneurysms has mostly been reported for cosmetic reasons.[1,3,5] The gold standard for diagnosis of lower extremity venous pathology including aneurysms is duplex ultrasound imaging. As the incidence of chronic venous insufficiency is becoming more recognized in the United States, it is likely that more venous aneurysms will be diagnosed incidentally during diagnostic studies for venous insufficiency. Currently, the appropriate management strategies for venous aneurysms involving superficial lower extremity veins are in a process of evolution with the advent of ever improving endovascular techniques. We present a case report of a venous aneurysm of the saphenofemoral junction associated with recurrent venous stasis ulcers that was misdiagnosed on preoperative imaging and a review of the literature.

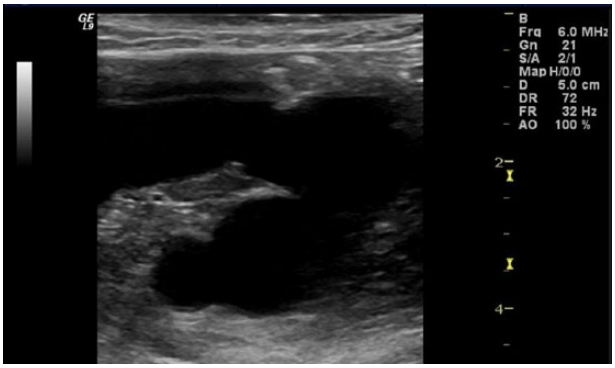

Figure 1. Preoperative venous duplex scan of the right saphenofemoral junction demonstrating an ectatic great saphenous vein but no aneurysm was detected as this time by the technician.

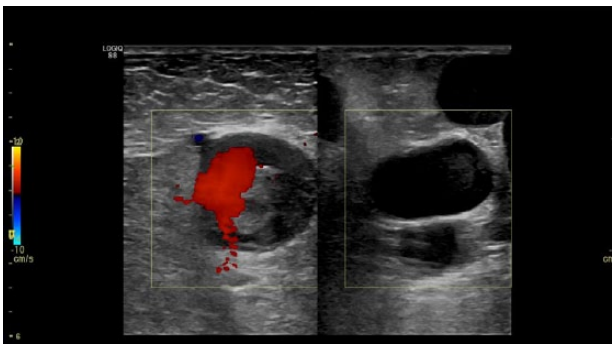

Figure 2. Post-radiofrequency ablation image of the left great saphenous vein demonstrating continued patency with flow detected on color flow imaging.

Case report

A 53-year-old female with a past medical history of morbid obesity (body mass index (BMI) of 41), osteoarthritis, a remote history of bilateral deep venous thrombosis, and severe chronic venous insufficiency (Clinical-Etiology-Anatomy-Pathophysiology (CEAP) Clinical Classification 6) presented to our clinic with refractory venous stasis ulcers of the bilateral lower extremities over the last 6 years. She was intermittently treated conservatively with PROFORE™ multi-layer compression bandaging system dressings (Smith and Nephew Inc., Andover, MA, USA) for 6-week periods with some improvement of the chronic venous stasis ulcers. A preoperative venous duplex scan demonstrated severe venous insufficiency of the superficial and deep systems of her bilateral lower extremities. Review of the preoperative duplex demonstrates an ectatic right GSV at its origin; however, a diagnosis of a venous aneurysm was not made at that time based on the images that were available (Figure 1).

The patient was recommended to undergo bilateral lower extremity radiofrequency ablation of the GSVs to facilitate wound healing and to reduce symptoms of her chronic venous insufficiency. Endovenous ablation of the left GSV was attempted; however, a post-procedure duplex scan indicated incomplete ablation of the left GSV (Figure 2). Failure of the radiofrequency ablation was attributed to the large size of the GSV (2.2 cm maximal diameter) and severe thickening of the vein from chronic inflammation. The patient was subsequently treated by open surgery with left GSV high ligation, saphenofemoral disassociation, and stripping of large varicose veins involving the left thigh and lower leg. Of note, the left GSV was diffusely enlarged, but there was no focal area of enlargement consistent with a venous aneurysm. The patient had an uneventful recovery from this surgical procedure and experienced complete healing of her left leg chronic venous stasis ulcers within a few weeks. Radiofrequency ablation of the right GSV was not performed due to factors associated with the prior failed intervention involving the left GSV. The right lower extremity ulcer was shallow, located on the medial aspect of the ankle, and measured 2.5 × 3 cm. The patient was again offered operative repair for her right lower extremity similar to the approach for her left lower extremity given the large size of the GSV and that as she had previously failed radiofrequency ablation on the left. During the high ligation of the right saphenofemoral junction, a 3 × 4 × 5 cm aneurysm was encountered (Figure 3). The aneurysm was noted to be superficial to the true right deep femoral system, and the right GSV and anterior saphenous vein appeared to be directly associated with it. Repair consisted of dissociation of the GSV and anterior saphenous vein with high ligation, aneurysm resection, and stripping of large varicose veins of the thigh and lower leg. Pathology confirmed that this lesion was ectatic venous tissue consistent with a venous aneurysm. The patient recovered uneventfully and experienced complete healing of the right leg venous stasis ulcer by postoperative week 4. The patient is being maintained on compression therapy for both of her legs lifelong.

Figure 3. Intraoperative photograph of the right saphenofemoral junction aneurysm.

Discussion

We report an association of a superficial venous aneurysm involving the saphenofemoral junction associated with recurrent venous stasis ulcers. Previous reports in the literature outline symptoms of lower extremity venous aneurysms include swelling, edema, mass effect, pain, deep vein thrombosis (DVT), and PE, but an association with stasis ulcers is not described.[1] In 22 out of the 31 deep venous aneurysms there was an associated PE or DVT. Furthermore, 17 out of the 22 cases with a PE or DVT had recurrent thromboembolic events when treated with anticoagulation alone. Conversely, venous reconstruction.

The exact mechanism for venous aneurysm formation in the lower extremity remains unknown, but venous reflux and hypertension that are the main forces responsible for chronic venous insufficiency and are thought to play a role in venous aneurysm development.[4] Venous aneurysms are not encountered in the same frequency as the fairly common diagnosis of chronic venous insufficiency, which points to other pathophysiologic mechanisms being responsible in their formation. Other groups have reported increased expression of matrix metalloproteinases on tissue analysis in the pathogenesis of these lesions similar to their role in arterial aneurysmal formation.[6] While there is not a causal link between venous aneurysms and venous stasis ulcers, the added areas of stasis and valve destruction within the aneurysmal segment could further contribute to downstream venous hypertension and participate in the development of skin ulceration. In our case, the patient-specific risk factors contributing to the development of venous insufficiency included prior venous thrombosis and morbid obesity.

The diagnosis of venous aneurysm can be made with a number of different modalities to include duplex ultrasound, computed tomography, magnetic resonance imaging, and venogram with the non-invasive nature of ultrasound making it the most common initial testing performed. The aneurysm in our case was not correctly diagnosed preoperatively, despite imaging with a venous duplex scan. This pattern of misdiagnosis is consistent with reports by Gillespie et al.[1] that 89% of venous aneurysms involving superficial veins in their series were misdiagnosed by ultrasound and only discovered at the time of surgery. Causes for misdiagnosis on ultrasound are multifactorial and include patient habitus, differences in ultrasonographer expertise, and anatomic variations. In our case, the patient's classification as morbidly obese likely contributed to difficultly performing the scan. Additionally, the tortious nature in multiple planes of the ectatic venous segment can lead to their interpretation as just enlarged segments as opposed to actual aneurysms. Further education of ultrasound technicians of this pathology is one method to avoid misdiagnosis in the future which was done at our institution following this case. Another method is to have a higher index of suspicion for an ectatic or aneurysmal GSV in patients who score highly on venous quality of life (QOL) indices or who are obese.[7] Multiple studies have cited a correlation between large GSV diameter (usually >7 mm) and a higher clinical CEAP classification.[8,9] However, a more recent study and review of the literature by Gibson et al.[7] compared multiple factors including CEAP classification, duplex characteristics, and patient morphometric data with venous QOL index scores and showed weak to no correlation between GSV diameter and patients' QOL. This study did however show correlation with increasing BMI and patients' QOL.

The first report of a venous aneurysm involved an aneurysm of the superior vena cava reported by Abbott[10] in 1950. The first report of a venous aneurysm in the lower extremity described a popliteal venous aneurysm in 1968 by May and Nissel.[11] Since that time, reported cases of lower extremity venous aneurysms remain scarce, with largest review of popliteal venous aneurysms numbering only 117 cases.[12] We review some of the largest collective experiences with venous aneurysms below.

Calligaro et al. reported a total of 44 lower extremity venous aneurysms consisting of 29 popliteal, 2 common femoral, and 13 superficial veins. Superficial aneurysms were treated for cosmetic reasons only with no complications. In all, 22 out of 31 deep venous aneurysms were associated with prior PE or DVT. In 22 out of the 31 deep venous aneurysms there was an associated PE or DVT. Furthermore, 17 out of the 22 cases with a PE or DVT had recurrent thromboembolic events when treated with anticoagulation alone. Conversely, venous reconstruction resulted in 76% popliteal patency and no recurrent PE. These results highlight the inadequacy of medical management alone to prevent thromboembolic events from deep venous aneurysms." after "Venous reconstruction resulted in 76% popliteal patency and no recurrent PEs. The authors state that "superficial extremity venous aneurysms are rarely symptomatic and rarely rupture; therefore the only indication for surgery is a disfiguring lesion."[3] However, this assertion may be challenged if the superficial venous aneurysms are associated with severe venous insufficiency.

Gillespie et al. reported a total of 39 venous aneurysms, of which only 2 involved the saphenofemoral junction. Superficial venous aneurysms were also noted to be associated with local pain, mass, swelling, and some extremity swelling. No reports off recurrent venous stasis ulcers were reported.

Pascarella et al.[5] reported 65 aneurysms lower extremity aneurysms found in 366 patients screened for venous insufficiency, which far exceeds the incidence of venous aneurysms reported in the past. In the classification scheme proposed by Pascarella et al. to describe lower extremity venous aneurysms, all classes involved veins distal to the terminal valve of saphenofemoral junction. The aneurysm reported by our group falls outside of this classification scheme. Their report did infer that there was a connection between venous aneurysms as a form of severe varicose veins.[13] In addition, the relationship between elevated BMI and higher hydrostatic intra-abdominal pressure was also correlated to the development of venous aneurysms.[14] Both the presence of severe varicose veins and high BMI were present in the patient we described. In contrast, Labropoulos et al.[15] reported only seven aneurysms out of 3380 scans for venous insufficiency. Another group, Rubin et al., reported only seven aneurysms diagnosed out of 2507 duplex scans, which is more similar to historical estimates of the prevalence of venous aneurysms as in the study referenced earlier by Labropoulus et al.[16] For now, the true incidence of venous aneurysms in patients with chronic venous insufficiency remains elusive.

Surgical repair was indicated in this case for the treatment of recurrent venous stasis ulcers and the potential for thromboembolism. Aneurysm resection, disassociation of the saphenofemoral junction with high ligation and stripping of large varicose veins resulted in substantial reduction of venous hypertension in the lower extremity and achieved prompt healing of the chronic venous stasis ulcers within 3 weeks. Conservative treatment with compression therapy alone was ineffective, and endovenous ablation was unlikely to be effective for the right lower extremity given the present of an aneurysm. In fact, radiofrequency ablation is contraindicated in cases of large venous aneurysms due to high failure rates.[5] The primary objective of treatment strategies for venous aneurysms is to reduce symptoms of reflux, pain, edema, varicosities and to prevent venous thromboembolism (VTE).[1] Most treatment strategies involve surgical ligation and excisions.[1,3–5] Endovenous ablation should be avoided.[5] There is a report of a successful endovascular coil and stent repair of a superficial venous aneurysms in an elderly individual,[17] but most patients with superficial venous aneurysms should be approached with a surgical options involving resection, ligation, and stripping of associated varicosities. Deep venous aneurysms have been treated with patch repair after tangential excision, end-to-end repair if possible after complete resection with excellent patency rates.[1,3,12,18,19] Interposition grafting with saphenous vein has been reported as well although somewhat disappointing patency rates.[1,3,18]

Conclusion

Superficial venous aneurysms of the lower extremity are rare and can be often missed on preoperative duplex ultrasound imaging. However, the diagnosis of the venous aneurysms is likely to increase as more patients are undergoing evaluation for chronic venous insufficiency. Large diameter measurements of the proximal greater saphenous vein and obesity increase the risk of missing aneurysms with duplex imaging; therefore, clinical suspicion must remain high. Repair is indicated when these aneurysms are associated with significant venous insufficiency and recurrent venous stasis ulcers.

Acknowledgements

Many thanks are given to the vascular team at the University of South Florida. All authors were involved in the preparation of this manuscript. E.R and B.P assisted in performing the operation, while R.W.J., G.R.P., and M.O. collected the data and wrote the manuscript. All authors have read and approved the final manuscript.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval

Our institution does not require ethical approval for reporting individual cases or case series.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Informed consent

Written informed consent was obtained from the patient(s) for their anonymized information to be published in this article.

References

1. Gillespie DL, Villavicencio JL, Gallagher C, et al. Presentation and management of venous aneurysms. *J Vasc Surg* 1997; 26: 845–852.
2. Caggiati A, Bergan JJ, Gloviczki P, et al. International interdisciplinary consensus committee on venous anatomical terminology. *J Vasc Surg* 2002; 36(2): 416–422.
3. Calligaro KD, Ahmad S, Dandora R, et al. Venous aneurysms: surgical indications and review of the literature. *Surgery* 1995; 117(1): 1–6.
4. Chen SI, Clouse WD, Bowser AN, et al. Superficial venous aneurysms of the small saphenous vein. *J Vasc Surg* 2009; 50: 644–647.
5. Pascarella L, Al-Tuwaijri M, Bergan JJ, et al. Lower extremity superficial venous aneurysms. *Ann Vasc Surg* 2005; 19: 69–73.
6. Irwin C, Synn A, Kraiss L, et al. Metalloproteinase expression in venous aneurysms. *J Vasc Surg* 2008; 48: 1278–1285.
7. Gibson K, Meissner M and Wright D. Great saphenous vein diameter does not correlate with worsening quality of life scores in patients with great saphenous vein incompetence. *J Vasc Surg* 2012; 56: 1634–1641.

8. Navarro TP, Delis KT and Ribeiro AP. Clinical and hemodynamic significance of the greater saphenous vein diameter in chronic venous insufficiency. *Arch Surg* 2002; 137(11): 1233–1237.
9. Mendoza E, Blättler W and Amsler F. Great saphenous vein diameter at the saphenofemoral junction and proximal thigh as parameters of venous disease class. *Eur J Vasc Endovasc Surg* 2013; 45(1): 76–78.
10. Abbott OA. Congenital aneurysms of the superior vena cava. *Ann Surg* 1950; 131: 259–263.
11. May R and Nissel R. Anevrysma der vena poplitea. *Rofo Fortschr Geb Rontgenstr Neuen Bildgeb Verfahr* 1968; 108: 402–403.
12. Sessa C, Nicolinia P, Perrin M, et al. Management of symptomatic and asymptomatic popliteal venous aneurysms: a retrospective analysis of 25 patients and review of the literature. *J Vasc Surg* 2000; 32: 902–912.
13. Pascarella L, Schmid-Schoenbein GW and Bergan J. An animal model of venous hypertension: the role of inflammation in venous valve failure. *J Vasc Surg* 2005; 41: 303–311.
14. Holman E and Peniston W. Hydrodynamic factors in the production of aneurysms. *Am J Surg* 1955; 90: 200–209.
15. Labropoulos N, Volteas SK, Giannoukas AD, et al. Asymptomatic popliteal vein aneurysms. *J Vasc Surg* 1996; 30: 453–457.
16. Rubin BG, Beak BI and Reilly JM. Fusiform aneurysms of the popliteal vein. In: *Proceedings of the 7th annual meeting of American venous forum* (abstract book), Fort Lauderdale, FL, 23–25 February 1995, p. 39. Hoffman Estates, IL: American Venous Forum.
17. Ross CB, Schumacher PM, Datillo JB, et al. Endovenous stent-assisted coil embolization for a symptomatic femoral venous aneurysm. *J Vasc Surg* 2008; 48: 1032–1036.
18. Gorenstein A, Kat S and Schiller M. Congenital aneurysms of the deep veins of the lower extremities. *J Vasc Surg* 1987; 5: 765–768.
19. Fankhauser GT, Stone WM, Fowl RJ, et al. Surgical treatment of lower extremity venous aneurysms. *J Vasc Surg* 2012; 56: 582–583.