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CASE REPORT

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Extensive but minimally symptomatic deep vein thrombosis in duplicated femoral veins

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Key Clinical Message

Duplicated femoral veins predispose to venous thrombosis, but patients may present with minimal/no symptoms. The required length of treatment is unclear, but periodic ultrasound surveillance may play a role in the absence of definitive treatment options.

KEYWORDS

anatomical variation, duplex ultrasonography, point-of-care testing, Poiseuille's law, primary care physician, rural and remote health, venous thromboembolism

1 | INTRODUCTION

Deep vein thromboses are often symptomatic with leg swelling, erythema, or calf tenderness, as a result of venous outflow obstruction and vascular inflammation. While not always identified, provoking factors of deep vein thromboses include venous stasis, endothelial injury and hypercoagulability, the latter of which can be inherited or acquired.

When identified, deep vein thromboses are easily treatable with therapeutic anticoagulation; but untreated, deep vein thromboses can rapidly extend within the venous system and/or embolize to cause pulmonary embolisms.

Here, we discuss a case of minimally symptomatic but extensive deep vein thromboses in a patient with duplicated femoral veins, the implications, and lessons applicable especially in rural and remote health settings.

2 | CASE DESCRIPTION

A 78-year-old Caucasian man who resides in a rural town 650 km away from the nearest metropolitan city presented to his primary care physician for regular prescription renewals. He has rheumatoid arthritis, well-controlled on methotrexate and hydroxychloroquine with no recent dose adjustments; and erythrocyte sedimentation rate of around 30 at baseline and at time of presentation. He also has hypertension, hypercholesterolemia and gout, for which he receives irbesartan, rosuvastatin and allopurinol, respectively. His other medical issues include obstructive sleep apnea, idiopathic benign hematuria (diagnosis after urological investigations), and previous hospitalization following severe epistaxis.

During the consultation, an otherwise asymptomatic unilateral left calf swelling was noted. Objectively, his left calf circumference was 2.5 cm more than the right, but there was no other significant examination findings. Further questioning revealed long-haul travels to and from a tourist destination more than 500 km and 7 h away in an automatic transmission vehicle just before onset of calf swelling, but no other risk factors. He was hemodynamically stable and denied any symptoms of pulmonary embolism. Compression ultrasonography undertaken on the same day revealed duplication of the femoral vein,

with extensive thrombus in one of the duplicated femoral veins and the popliteal and below knee veins.

Subsequent thrombophilia screen revealed normal antithrombin, Protein C and Protein S levels; negative screen for common variant in the F2 and F5 genes, and the beta-2 glycoprotein and cardiolipin antibodies. Clinical consideration was made for malignancy as a contributing cause of thrombosis, but there were no suggestive red-flag symptoms. He was previously known to have colonic polyps and pulmonary ground glass opacity in his left lower lung lobe, for which he continues to receive surveillance colonoscopy and surveillance computed tomography imaging; the latter was stable on recent studies.

The patient was commenced on therapeutic apixaban (10 mg twice a day for 7 days followed by 5 mg twice a day), with repeat compression ultrasonography 12 days and 3 months later both showing similar extent of thrombus, but recanalized veins with post-thrombotic scarring after 9 months. His apixaban was then reduced to 2.5 mg twice a day in consultation with hematology, and planned to continue lifelong. The patient has not developed any bleeding complications 28 months since initial onset, and we continue to closely follow up on this patient.

3 | DISCUSSION

3.1 | Pathophysiology of duplicated femoral veins

Duplication of the femoral vein is reportedly a common anatomical variation, with one study identifying such variation in 55% of all examined limbs.[1] Limbs with multiple femoral veins have a higher incidence of deep vein thromboses compared to those with a single femoral vein (40% vs. 19%; $p < 0.001$), and a lower proportion of these patients experienced symptoms (41% vs. 72%; $p < 0.001$).[2]

Additional femoral vein(s) likely provide collateral flow, which alleviates venous obstruction secondary to deep vein thromboses; resulting in minimal or no symptoms normally experienced with deep vein thromboses. Untreated, these thrombi propagate and eventually embolize into the pulmonary circuit. Case reports exist for severe pulmonary embolisms as the first presentation of venous thromboembolism in duplicated femoral veins.[3] The delayed presentation of our patient likely allowed for thrombus propagation, but had not resulted in pulmonary embolism.

Duplicated femoral veins increase the total cross-sectional area of these venous systems.[4] Poiseuille's Law requires that for venous flow to be constant, the velocity of blood flow must be reduced within such systems. This is consistent with the increased predisposition to deep vein thromboses among individuals with duplicated femoral veins.[2]

It is plausible that flow velocity in our patient's femoral veins were already reduced at baseline. His long-haul travels, temporally correlated to symptom onset, could have further contributed to venous stasis (especially in the left leg, given his use of an automatic transmission vehicle), provoking thrombus formation. This seems consistent with another case of travel-provoked deep vein thromboses in a patient with duplicated femoral veins and hemophilia A, a condition causing impaired clotting.[5] However, the possibility of a pre-existing thrombus prior to his long-haul travels could not be ruled out.

The reportedly high incidence of duplicated femoral veins and the potential for asymptomatic or minimally symptomatic deep vein thromboses highlight the need for high index of suspicion for this easily treatable, but potentially lethal condition. There is, however, no established length for treatment in the context of duplicated femoral veins as a persistent risk factor. Both cases cited above experienced a recurrence of pulmonary embolisms 2 and 4 months after completing 6 months of anticoagulation, respectively.[3] The role of surgical ligation had been raised, but not formally investigated. It may be that periodic surveillance ultrasound, now readily accessible, plays an important role until more definitive treatment options become available.

3.2 | Point-of-care ultrasound

While there has been calls for increasing use of point-of-care diagnostics, including point-of-care ultrasound, practical barriers for its adoption include the need for dedicated training to develop and maintain necessary skills,[6] costs associated with acquisition of equipment and record keeping software subscriptions,[7] and the fee-for-service funding model of primary care in Australia, which does not currently renumerate its use. The confidence level for any findings, and possible medicolegal implications of acting on point-of-care findings also require clarification and official professional body position and guidelines, especially for diagnoses traditionally confirmed by formal studies and those with risks associated with treatment.

3.3 | Specialist input for patients living in rural and remote areas

In Australia, patients residing in rural and remote areas are known to have decreased access to both primary care and non-primary care specialist input, resulting in poorer health outcomes.[8,9] Various specialties have initiated

innovative outreach models, including eHealth interventions. Such efforts need to continue with adequate resourcing for development, maintenance and quality improvement of these programs.

4 | CONCLUSION

Duplicated femoral veins is a reportedly common anatomical variant, resulting in increased venous stasis thus predisposing to venous thrombosis, which may present with minimal symptoms. The role of surgical ligation had been raised, but not formally investigated. There is no standardized recommendation for length of therapeutic anticoagulation, with previous reports of recurrence following completion of an extended course. Periodic ultrasound surveillance may play an important role.

This case highlights the importance of the primary care physician's central role in initiating investigation and management while awaiting any specialty input, especially where delays may be expected. Innovations to improve equity in healthcare outcomes among patients residing in rural and remote areas need to be encouraged and adequately resourced.

AUTHOR CONTRIBUTIONS

Joel Ern Zher Chan: Conceptualization; data curation; formal analysis; investigation; methodology; validation; writing – original draft; writing – review and editing. **Dmytro Podorozhnyy:** Conceptualization; data curation; formal analysis; investigation; methodology; supervision; validation; writing – review and editing.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

CONSENT

Written informed consent was obtained from the patient to publish this report in accordance with the journal's patient consent policy.

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REFERENCES

1. Casella IB, Presti C, Yamazaki Y, et al. A duplex scan-based morphologic study of the femoral vein: incidence and patterns of duplication. *Vasc Med*. 2010;15(3):197-203.
2. Liu GC, Ferris EJ, Reifsteck JR, et al. Effect of anatomic variations on deep venous thrombosis of the lower extremity. *AJR Am J Roentgenol*. 1986;146(4):845-848.
3. Garcia-Fuster MJ, Fabia MJ, Forner MJ, et al. Deep venous thrombosis in duplicated superficial femoral veins. *Thromb Res*. 2009;124(3):379-380.
4. Dona E, Fletcher JP, Hughes TM, et al. Duplicated popliteal and superficial femoral veins: incidence and potential significance. *Aust N Z J Surg*. 2000;70(6):438-440.
5. Stewart AJ, Manson LM, Dennis R, Allan PL, Ludlam CA. Thrombosis in a duplicated superficial femoral vein in a patient with haemophilia A. *Haemophilia*. 2000;6(1):47-49.
6. Arnold A, Fleet R, Lim D. A case for mandatory ultrasound training for rural general practitioners: a commentary. *Rural Remote Health*. 2021;21(3):6328.
7. Baribeau Y, Sharkey A, Chaudhary O, et al. Handheld point-of-care ultrasound probes: the new generation of POCUS. *J Cardiothorac Vasc Anesth*. 2020;34(11):3139-3145.
8. Australian Institute of Health and Wellbeing. *Rural and Remote Health (v77.0)*. AIHW; 2023. https://www.aihw.gov.au/reports/rural-remote-australians/rural-and-remote-health. Accessed May 25, 2023.
9. Falster M, Jorm L. *A guide to the potentially preventable hospitalisations indicator in Australia*. Centre for big Data Research in health, University of Ne Australian Commission on Safety and Quality in Health Care and Australian Institute of Health and Welfare; 2017.

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