INTRODUCTION

Inferior vena cava thrombosis (IVCT) is a rarely seen clinical condition. It is an under-recognized entity which is associated with significant morbidity and mortality. Deep vein thrombosis (DVT) is a medical condition that occurs when a blood clot forms in a deep vein. These clots usually develop in the lower leg, thigh, or pelvis. Inferior vena cava thrombosis can present with a wide variety of symptoms, making it challenging to determine the exact incidence of the condition. It is estimated that around 2.6 to 4.0 percent of patients with lower extremity DVT have IVCT. The patient did not have any etiology of prothrombotic factors or abdominal pathology. The only peculiar observation was that he had an elevated serum homocysteine level. Although elevated homocysteine levels were found in 40% of vascular disease patients and 35% of venous thromboembolism patients in a previous study, high homocysteine levels in the absence of any other etiology are a rare phenomenon.

CASE REPORT

A 78-year-old male farmer was admitted with a history of a sudden onset of pain and swelling over his left leg. He did not complain of fever, chest pain, shortness of breath, cough, or syncope. A family history of thrombophilia, autoimmune diseases, and hematological malignancies was absent. His personal history included 15 years of alcohol abuse, which he ceased 10 years ago. Medical history included hypertension under antihypertensive medications for 5 years and open-angle glaucoma for 8 years. He denied any history of recent
trauma or surgical intervention or immobilization. On examination, his vital signs and systemic examinations were unremarkable. Besides his general appearance, he looked well-nourished and had a body mass index (BMI) of 26.03. Local examination showed ecchymosis, raised temperature, with pitting edema around the left knee with multiple blisters. There was no compromise in the perfusion or motor functions of the leg; deep tendon reflexes were preserved, and muscle power was 4/5. In addition, his mid-thigh circumference and mid-calf circumference measured 22 inches and 12 inches, respectively, as shown in Figure 1.

The patient's history and physical findings pointed toward a likely diagnosis of DVT with a modified Wells criteria score of 4 points. An urgent venous Doppler ultrasound of the left leg vein was performed, which revealed acute DVT involving the left superficial femoral, common femoral, external iliac, common iliac veins, and lower part of the IVC. Minimal recanalization of the mid and distal superficial femoral veins with slow flow was noted. Partially occlusive thrombus was also found in the popliteal and proximal posterior tibial veins with diffuse subcutaneous edema. The right leg veins showed no evidence of thrombosis. Following that, he was immediately started on low-molecular-weight heparin 120 mg/day subcutaneous route and oral warfarin 5 mg/7.5 mg on alternate days. The laboratory results are presented separately in Table 1. The complete blood count (CBC), kidney, and liver functions were normal. Meanwhile, serum homocysteine levels were >50 mol/L (normal range 5–15 mmol/L), D-dimer was 2.15 mg/L (normal range <0.5 mg/L), and fibrin degradation product (FDP) was 200 ng/mL (normal range <10 ng/ml). The thrombophilia profile (factor V Leiden, antithrombin III, protein C, and protein S) was negative.

During his stay in the ward on the second day, it was observed that the patient developed a sudden onset of cough, resting tachycardia, tachypnea, disorientation status, and mild cognitive impairment. He had bilateral decreased air entry, and oxygen saturation was maintained at 0.5 liters of oxygen via nasal cannula. He was shifted to the intensive care unit (ICU) as a pulmonary embolism was suspected. A pulmonary computed tomography (CT) angiography was carried out, which ruled out pulmonary embolism. However, extensive images of the abdomen showed IVC thrombosis as shown in Figures 2 and 3. He received monitoring, chest physiotherapy, and mobilization in the ICU. His echocardiography showed normal right atrium and right ventricle, normal left ventricular systolic function (normal range 50%–75%) with grade I left ventricular diastolic dysfunction. Mild tricuspid regurgitation (TR) with an estimated pulmonary artery systemic pressure (PASP) of 30 mm of mercury (normal PASP ≤ 35 mmHg) was noted. Low-molecular-weight heparin injection and oral warfarin were stopped and was started on the novel oral anticoagulant rivaroxaban at 30 mg/day for 2 weeks, then 20 mg/day as a maintenance dose. He was then shifted to the medical ward for further treatment. The patient was started on methylcobalamin and folic acid treatment and responded well to the treatment during his stay in the ward. As his symptoms started to subside, he was then discharged on the 12th day of his admission. On the day of discharge, his mid-thigh and mid-calf circumferences were 21 inches and 10.5 inches, respectively, as shown in Figure 1. He was advised to continue oral rivaroxaban and antihypertensive medications and come for a follow-up after a week.

On follow-up after 10 days, a repeat venous Doppler ultrasound showed good recanalization of the left common femoral, superficial femoral, and popliteal veins, with the

FIGURE 1 Swelling of the lower limbs due to inferior vena cava thrombosis. (A) Visible swelling was noted in the left lower limb area at the time of admission. Mild swelling was observed in the right lower limb. (B) Swelling markedly decreased in the both lower limb at the time of discharge after 12 days.
| Year | **2022** |
|------|---------|
| **Date** | **Reference Range** | **07/03** | **09/03** | **10/03** | **11/03** | **12/03** | **13/03** | **14/03** | **15/03** | **16/03** | **17/03** | **18/03** |
| **WBC Count (/cu mm)** | 4500–11,000/cc mm | 10,090 | 10,610 | 10,950 | 8150 | 8650 | 8660 | 6190 |
| **Hb (g/dl)** | F: 12–16 g/dl | 11.9 | 12.3 | 12.2 | 12.2 | 11.6 | 12 | 11.5 |
| **RBC Count (10^{12}/L)** | F: 3.9–5.2 × 10^{11}/L | 3.77 | 3.85 | 3.9 | 3.91 | 3.63 | 3.9 | 3.6 |
| **Hct(%)** | F: 36–46% | 34.8 | 35.4 | 37.3 | 35.8 | 32.8 | 37.4 | 32.6 |
| **Platelet Count (×10^5/mm^3)** | 1.5–4 × 10^5/mm^3 | 1.55 | 1.55 | 1.51 | 1.61 | 1.55 | 1.76 | 1.88 |
| **MCV (fl)** | 80–100 fl | 92.3 | 91.9 | 95.6 | 91.6 | 90.4 | 95.9 | 90.6 |
| **MCH (pg/cell)** | 25.4–34.6 pg/cell | 31.6 | 32 | 31.3 | 31.2 | 31.9 | 30.8 | 31.9 |
| **MCHC (g/dl)** | 31–37 g/dl | 34.3 | 34.8 | 32.7 | 34.1 | 35.3 | 32.1 | 35.2 |
| **Urea (mg/dl)** | 7–30 mg/dl | 60 | 33 | 32 | 37 | 39 | 36 | 34 |
| **Creatinine (mg/dl)** | 0.6–1.2 mg/dl | 1.1 | 1.1 | 1 | 0.9 | 0.9 | 1 | 0.8 |
| **Sodium (mmol/L)** | 136–145 mmol/L | 136 | 131 | 135 | 134 | 131 | 137 | 137 |
| **Potassium (mmol/L)** | 95–105 mmol/L | 4.3 | 4.1 | 4.7 | 4.3 | 3.7 | 4.5 | 4.1 |
| **INR** | 0.9–1.2 | 1.2 | 1.5 | 1.73 | 1.91 | 2.27 | 1.94 | 3.36 | 3.19 | 2.86 | 1.89 |
| **APTT (s)** | 20–40 sec | 28 | 30.6 | 43 |
| **RBS (mg/dl)** | 65–110 mg/dl | 136 | 113 | 89 | 111 |
| **Total Bilirubin (mg/dl)** | 0.1–1.2 mg/dl | 0.7 |
| **Indirect Bilirubin (mg/dl)** | 0.2–1.2 mg/dl | 0.6 |
| **Direct Bilirubin (mg/dl)** | <0.3 mg/dl | 0.1 |
| **Alkaline Phosphate (U/L)** | 50–100 U/L | 85 |
| **Total Protein (g/L)** | 6–8.3 g/dl | 5.9 |
| **Albumin (g/dl)** | 3.4–5.4 g/dl | 3.5 |
| **SGOT (U/L)** | 5–30 U/L | 29 |
| **SGPT (U/L)** | 5–30 U/L | 26 |
| **G-GT (U/L)** | 6–50 U/L | 23 |
| **FDP (ng/ml)** | <10 ng/ml | Positive (Aprox.200) |
| **D-Dimer (mg/L)** | <0.5 mg/L | 2.15 |

(Continues)
slow flow in the lumen of these veins. No obvious thrombus was observed inside the calf veins. Very minimal-to-no recanalization of the left common iliac and external iliac veins. The patient reported decreased swelling without any other complications. Since then, he has been on anticoagulant and was further advised to follow-up after 3 months.

3 | DISCUSSION

Inferior vena cava thrombosis in a patient is rare and is usually a result of a predisposing hypercoagulable state along with an acquired pathology in the IVC or one of its adjacent structures.\(^1\)\(^-\)\(^10\) Etiologically, there are prothrombotic factors, such as thrombophilia, malignancy, oral contraceptives, smoking, obesity, pregnancy, hormonal replacement therapy, and nephrotic syndrome. Besides these, there are abdominal pathologies such as renal cell tumors, abdominal masses producing extrinsic compressions such as a very large uterine fibroid, Budd–Chiari syndrome, abdominal trauma/surgery, May–Thurner syndrome, and thrombotic occlusion of an IVC filter. Meanwhile, a recent study has shown local problems such as IVC anomalies contribute 11.3 percent, external venous compression contributes 11.3 percent, malignancy contributes 17.0 percent, and the presence of lupus anticoagulants contributes 10.9 percent to the risk of IVCT.\(^11\) There are some interesting clinical aspects in the reported case. He did not relate to the aforementioned etiologies and differed from them in all aspects. He had a sudden onset of symptoms related to venous thromboembolism. The only medical history he had was of hypertension, which was well-managed by antihypertensive medication. A high level of serum homocysteine was a new observation for us. The only other risk factors to be taken into account, after ruling out the common conditions, were gender and age, which would be appropriate to discuss with this patient, extending from the leg to the IVC. However, the positive finding of hyperhomocysteinemia gives credence to the diagnosis.

The association between DVT and hyperhomocysteinemia was first reported in 1991, and since then, a large number of prospective and retrospective trials have established a relation between hyperhomocysteinemia and DVT.\(^12\) Mild hyperhomocysteinemia appears to be an independent risk factor for arterial vascular disease and thromboembolic risk factors.\(^13\) Homocysteine levels can be raised by altered methionine metabolism, which can occur as a result of genetic defects affecting the transcription of enzymes responsible for homocysteine metabolism. Many other factors, such as age, smoking, renal impairment, diabetes mellitus, hypothyroidism, and other
nutritional deficiencies of folic acid, vitamin B6, and vitamin B12, and drugs such as phenytoin, carbamazepine, and methotrexate, may be linked to hyperhomocysteinemia.12,14 The case describes a rare, identifiable risk factor contributing to IVCT, which captures the attention.

4 | CONCLUSION

The case emphasizes the importance of performing a complete hypercoagulable workup on any patient who presents with DVT. Furthermore, the findings underline the importance of homocysteine levels in the diagnosis of venous thrombosis. Inferior vena cava thrombosis is a less prevalent and less well-known condition than lower extremity thrombosis, and early intervention is indeed essential well before the development of pulmonary embolism.

AUTHOR CONTRIBUTIONS

PS, BP, BS, and RA were involved in patient care (diagnosis, treatment, and follow-up). SP provided us with the required images. RA, AS, SS, BS, PS, and BP contributed to the collection of case information, writing of the manuscript, and manuscript revision. All authors approved the final version.

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CONFLICT OF INTEREST

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

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available upon reasonable request.

ETHICS STATEMENT

The study protocol was approved by the Ethical Review Committee of Grande International Hospital. The reporting of this study conforms to CARE Guidelines (Check list in Appendix S1).15
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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SUPPORTING INFORMATION
Additional supporting information can be found online in the Supporting Information section at the end of this article.

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