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Inferior Vena Cava Thrombosis in Its Juxtaright Atrial Segment Diagnosed by Transthoracic Echocardiography: A Case Report from Sub-Saharan Africa

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Abstract

Background: Inferior vena cava (IVC) thrombosis is an uncommon but clinically significant form of proximal deep venous thrombosis, accounting for 4% - 15% of all venous thromboembolic events. When the thrombus extends into the juxtaright atrial segment of the IVC, it carries an elevated risk of fatal pulmonary embolism and intracardiac complications. In sub-Saharan Africa, this condition remains largely underreported, partly due to limited access to advanced imaging modalities. **Case Presentation:** We report the case of a 66-year-old hypertensive male who presented to the Department of Cardiology B at the University Hospital of Brazzaville, Republic of Congo, with bilateral lower-limb oedema following a prolonged journey. His past medical history was notable for congestive heart failure with moderate left ventricular systolic dysfunction (January 2025), a type 1 cardiorenal syndrome, and a strong clinical suspicion of hepatocellular carcinoma based on painless hepatomegaly, markedly elevated alpha-fetoprotein, and elevated liver enzymes. Two-dimensional transthoracic echocardiography (TTE) using a subcostal view identified a thrombus measuring 20 × 9 mm within a dilated IVC (25 mm), extending to its juxtaright atrial portion. Venous duplex ultrasonography of the lower limbs was unremarkable. Laboratory workup revealed normochromic normocytic

anaemia (haemoglobin 10 g/dL) and mild renal impairment (creatinine 16.8 mg/L; eGFR 52.99 mL/min). The patient was initiated on rivaroxaban (15 mg twice daily for 21 days, followed by 20 mg once daily), alongside losartan, spironolactone, dapagliflozin, rosuvastatin, and vitamin E. Bilateral oedema resolved by day 14; however, the IVC thrombus persisted. Given the unavailability of mechanical thrombectomy in Congo, the patient was referred to Morocco, where the procedure was performed in October 2025. Anticoagulation was continued upon discharge. One month later, the patient died suddenly at home; no autopsy was performed. **Conclusion:** This case highlights the diagnostic value of TTE in identifying juxtaright atrial IVC thrombosis in resource-limited settings, where MRI and CT angiography may not be readily accessible. Prolonged immobilisation during travel, combined with an underlying hypercoagulable state related to suspected hepatocellular carcinoma, likely contributed to thrombus formation. Prompt initiation of direct oral anticoagulants, as recommended by current ESVS guidelines, was feasible and clinically beneficial. The lack of on-site interventional vascular facilities remains a critical challenge in sub-Saharan Africa. Echocardiographic screening should be considered in patients presenting with lower-limb oedema and an elevated thromboembolic risk profile.

Keywords

Inferior Vena Cava Thrombosis, Transthoracic Echocardiography, Direct Oral Anticoagulants, Hepatocellular Carcinoma, Deep Venous Thrombosis, Sub-Saharan Africa

1. Introduction

Inferior vena cava (IVC) thrombosis is defined as the partial or total occlusion of the IVC by a thrombus and belongs to the spectrum of proximal deep venous thromboses [1]. Although less prevalent than lower-limb deep venous thrombosis (DVT), it accounts for 4% - 15% of all venous thromboembolic events [1]. Cases have been reported predominantly from North Africa: Rachdi *et al.* [2], Dahli *et al.* [3], and Mkaouar *et al.* [4] described 9, 16, and 22 cases, respectively, from internal medicine units. In sub-Saharan Africa, however, the condition remains largely underreported, with very few published observations.

Thrombosis involving the juxtaright atrial segment of the IVC is a particularly uncommon and potentially life-threatening variant. Published case series indicate that such proximal extension carries an increased risk of cardiac embolisation and fatal pulmonary embolism [5]-[9]. Common clinical manifestations include bilateral lower-limb swelling, abdominal pain, and lumbar discomfort [1]-[4]. Predisposing factors include malignancy, prothrombotic disorders, prolonged immobilisation, abdominal or pelvic surgery, and pre-existing venous filters [1] [10].

The diagnostic work-up relies primarily on non-invasive imaging: Doppler ultrasonography, computed tomography (CT) venography, and magnetic reso-

nance imaging (MRI), the latter being considered the reference standard [1]. When thrombosis extends to the juxtaright atrial IVC, transthoracic echocardiography (TTE) has demonstrated diagnostic accuracy equivalent or superior to cross-sectional imaging for thrombus detection, haemodynamic assessment, and therapeutic guidance [5]-[9]. In sub-Saharan Africa, limited access to MRI and CT makes TTE a pragmatic and often indispensable diagnostic tool.

Management centres on systemic anticoagulation to prevent pulmonary embolism and post-thrombotic syndrome, with emerging evidence supporting the use of direct oral anticoagulants (DOACs) as recommended by the European Society for Vascular Surgery (ESVS) [11]. Catheter-directed thrombolysis or mechanical thrombectomy may be considered in selected cases [12]. We herein report a case of juxtaright atrial IVC thrombosis diagnosed by TTE in a patient with suspected hepatocellular carcinoma and recent prolonged immobilisation, managed in the context of a resource-limited healthcare setting.

2. Case Presentation

A 66-year-old retired civil servant, married with four children, was admitted on 6 July 2025 to the Department of Cardiology B, University Hospital of Brazzaville, Republic of Congo, for bilateral lower-limb heaviness and oedema of ten days' duration. Written informed consent was obtained from the patient's family for publication of this case.

2.1. Past Medical and Therapeutic History

In January 2025, the patient had been hospitalised for congestive heart failure with moderate left ventricular systolic dysfunction and a type 1 cardiorenal syndrome, which resolved with iron supplementation, vitamin E, and statin therapy. At discharge, he was prescribed a low-sodium diet, furosemide 40 mg/day, losartan 50 mg/day, and dapagliflozin 10 mg/day.

During the same hospitalisation, a hepatocellular carcinoma was suspected on the basis of painless hepatomegaly, a markedly elevated serum alpha-fetoprotein (AFP), elevated liver transaminases, and an icteric-ascitic-oedematous syndrome. No histological confirmation had been obtained prior to this admission.

2.2. History of Present Illness

Symptoms recurred ten days prior to admission, following a prolonged journey during which the patient remained seated for more than four consecutive hours. Bilateral lower-limb swelling and heaviness progressively worsened, prompting an urgent consultation. No chest pain, dyspnoea, haemoptysis, or syncope was reported.

2.3. Physical Examination

On admission, the patient was conscious and haemodynamically stable. Vital signs included: temperature 37˚C, heart rate 80 beats per minute (regular), blood

pressure 130/70 mmHg, and oxygen saturation 98% on room air. Body weight was 87.3 kg (previous weight 90 kg; 3% weight loss over six months), height 178 cm (BMI 27.5 kg/m^2). WHO performance status was 2. Urinary output was 1500 mL/24 hours. Thoracic examination revealed a normal chest configuration. Abdominal examination demonstrated a painless hepatomegaly (hepatic span 21 cm) with a firm consistency, regular surface, and a sharp lower margin. Bilateral lower-limb pitting oedema, non-tender and with a firm consistency, was present. Homans' sign was absent. No signs of pulmonary hypertension or right heart failure were identified on cardiovascular examination.

2.4. Investigations

Electrocardiography (*ECG*): Standard 12-lead ECG showed sinus rhythm at 79 beats per minute with no ischaemic changes, no right ventricular strain pattern, and no arrhythmia.

Chest X-ray: Posteroanterior chest radiograph demonstrated cardiomegaly (cardiothoracic ratio 60%) and elevation of the right hemidiaphragm. Pulmonary parenchyma appeared normal, with no pleural effusion or signs of pulmonary oedema.

Transthoracic echocardiography (*TTE*): Two-dimensional TTE using the subcostal view demonstrated a dilated IVC (maximum diameter 25 mm) containing a hyperechoic, mobile thrombus measuring 20 × 9 mm, extending to the juxtaright atrial segment (**Figure 1**). Right heart cavities were not dilated. Left ventricular ejection fraction was preserved. No intracardiac extension of the thrombus was observed into the right atrium proper.

Pulmonary embolism was systematically assessed at presentation. Clinically, the patient denied dyspnoea, pleuritic chest pain, haemoptysis, and syncope; no arterial hypotension or fever was observed. ECG showed no right axis deviation, no S1Q3 pattern, no new right bundle branch block, and no anterior T-wave inversions. TTE demonstrated no right ventricular dilatation, preserved right ventricular systolic function (TAPSE ≥ 17 mm), no paradoxical interventricular septal motion, and no echocardiographic signs of pulmonary hypertension. The combination of these negative clinical, electrocardiographic, and echocardiographic findings made concurrent pulmonary embolism unlikely. CT pulmonary angiography was not performed due to the patient's financial constraints.

Lower-limb venous Doppler ultrasonography: No thrombosis was detected in the deep venous system of either lower limb.

Laboratory workup: Full blood count revealed normochromic normocytic anaemia (haemoglobin 10 g/dL). Serum creatinine was 16.8 mg/L (estimated glomerular filtration rate [eGFR] by CKD-EPI: 52.99 mL/min/1.73m^2). Serum electrolytes were within normal limits. Liver function tests revealed elevated transaminases (AST 126 UI/L, ALT 309 UI/L, alkaline phosphatase 170 UI/L) and a markedly elevated serum alpha-fetoprotein (AFP 26.82 ng/mL), supporting the clinical suspicion of hepatocellular carcinoma. Coagulation assessment showed a pro-

thrombin ratio >70%, INR 0.9, and platelet count 300,000/mm^3, indicating preserved hepatic synthetic function. D-dimer levels were not obtained.

Note: CT venography and MRI were not performed, owing to financial constraints and equipment unavailability at the referring centre. No thrombophilia screening was conducted.

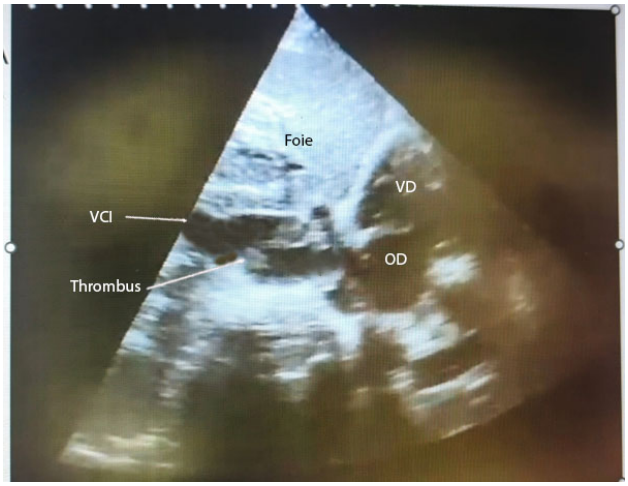

Figure 1. Two-dimensional transthoracic echocardiography, subcostal view. The inferior vena cava (VCI) is dilated (25 mm) and contains a voluminous hyperechoic thrombus (20 × 9 mm) extending to the juxtaright atrial segment. OD = right atrium; VD = right ventricle; VCI = inferior vena cava.

2.5. Treatment and Clinical Course

Anticoagulation was promptly initiated with rivaroxaban 15 mg twice daily for 21 days (induction phase), followed by 20 mg once daily (maintenance phase), in accordance with ESVS 2021 guidelines [11]. Concurrent medications included: losartan 50 mg/day, spironolactone 25 mg/day, dapagliflozin 10 mg/day, rosuvastatin 5 mg/day, and vitamin E (1 capsule/day). A sodium-restricted diet was maintained.

By day 14 of hospitalisation, bilateral lower-limb oedema had completely resolved. Repeat TTE confirmed the persistence of the IVC thrombus without any change in morphology or extension. Given the absence of catheter-directed thrombolysis or mechanical thrombectomy facilities at our institution, the patient was referred abroad. Mechanical thrombectomy was performed in Morocco in October 2025, four months after initial presentation. The referring hospital was selected by the patient and his family. The patient died before returning to the Republic of Congo; consequently, the medical records from the Moroccan centre—including the specific device type, peri-procedural anticoagulation strategy, and post-procedure imaging findings—were never transmitted to our team and remain unavailable to the authors.

One month following the thrombectomy, the patient died suddenly at home. No autopsy was performed, and the cause of death remains undetermined. Potential contributing mechanisms include fatal pulmonary embolism due to anticoag-

ulant non-adherence, tumour progression, or cardiac arrhythmia in the context of underlying structural heart disease.

3. Discussion

IVC thrombosis involving the juxtaright atrial segment is an uncommon and clinically challenging condition. The rarity of published case reports from sub-Saharan Africa underscores both the underdiagnosis of this entity in low-resource settings and the limited availability of advanced diagnostic technologies [1]-[4]. This observation contributes to the sparse existing literature by illustrating both the diagnostic utility of TTE and the therapeutic challenges faced in resource-constrained environments.

3.1. Epidemiological and Aetiological Considerations

IVC thrombosis accounts for 4% - 15% of venous thromboembolic events [1], with a slight male predominance reported by several North African series [2]-[4], consistent with the present case. Verkimpe *et al.* [13] identified a frequency of 11% in a retrospective cohort of 165 patients. The condition affects individuals across a wide age range, from young adults to the elderly [2]-[4] [6], as exemplified by our 66-year-old patient.

In the present case, two major prothrombotic mechanisms were identified. First, prolonged seated immobilisation during a transcontinental journey (>4 hours) caused venous stasis through compression of the deep femoral veins by a firm seat surface, reducing venous return and predisposing to thrombosis—a well-established mechanism in economy-class syndrome [1]. Second, the suspected hepatocellular carcinoma represents a significant hypercoagulable state through three principal mechanisms: 1) secretion of procoagulant substances by tumour cells activating the coagulation cascade; 2) tumour-related immobilisation and direct venous compression; and 3) vascular wall injury related to the hepatic tumour or its sequelae [1]. Although histological confirmation of malignancy was not obtained, the combination of painless hepatomegaly, markedly elevated AFP, elevated transaminases, and clinical context strongly supported this diagnosis.

3.2. Diagnostic Approach

Clinical presentation typically includes bilateral lower-limb oedema, abdominal pain, and lumbar discomfort [1]-[4] [13], all of which were present in our patient. While MRI remains the gold standard for IVC thrombosis diagnosis [1], its high cost and limited availability in sub-Saharan Africa significantly restrict its use. In this context, TTE performed via the subcostal window proved to be a valuable and accessible diagnostic alternative, consistent with previous reports [5]-[9].

TTE provides several diagnostic advantages for juxtaright atrial IVC thrombosis: 1) direct visualisation of the IVC and thrombus; 2) thrombus characterisation (morphology, echogenicity, mobility); 3) haemodynamic evaluation of right heart cavities and estimated pulmonary arterial pressure; and 4) guidance of an-

tithrombotic management and monitoring of treatment response [5]-[9]. In our patient, TTE revealed a mobile thrombus confined to the juxtaright atrial IVC, with preserved right ventricular dimensions and function, suggesting the absence of acute cor pulmonale at the time of assessment. The normal lower-limb venous Doppler ultrasonography pointed to a de novo IVC thrombus rather than propagation from a peripheral DVT, potentially reflecting direct venous injury from tumour invasion or stasis at the IVC level.

Differentiation between bland and tumour thrombus is a critical diagnostic question in this patient. A bland thrombus is composed predominantly of platelets, leucocytes, and fibrin; it forms rapidly in the context of endothelial injury or venous stasis, and responds favourably to anticoagulation. In contrast, a tumour thrombus consists of malignant cells invading the vascular lumen from an adjacent solid tumour (liver, kidney); it does not respond reliably to anticoagulation alone and requires concurrent oncological treatment. In the present case, several features could support a bland thrombus: the temporal association with prolonged immobilisation, and initial clinical response (oedema resolution at day 14). Conversely, the persistence of the IVC thrombus despite 14 days of therapeutic rivaroxaban, combined with strongly suspected hepatocellular carcinoma, raises the possibility of a tumour thrombus component. Definitive characterisation requires contrast-enhanced CT or MRI—neither available in our setting—where intraluminal enhancement is pathognomonic of tumour thrombus. This distinction carries major therapeutic and prognostic implications and represents a critical unresolved diagnostic gap in this case.

Furthermore, prompt diagnosis and anticoagulation initiation are essential to prevent progression toward acquired IVC atresia, a recognised complication of untreated iliocaval thrombosis [14].

3.3. Therapeutic Strategy

Management of IVC thrombosis integrates treatment of the underlying cause and prevention of pulmonary embolism and post-thrombotic syndrome [1]-[4]. Systemic anticoagulation represents the cornerstone of therapy. The 2021 ESVS Clinical Practice Guidelines endorse DOACs as a first-line option for proximal DVT, including IVC thrombosis, based on evidence from large randomised controlled trials demonstrating non-inferiority to vitamin K antagonists with a more favourable safety profile [11]. The rivaroxaban regimen applied in this case (15 mg twice daily for 21 days, then 20 mg once daily) conforms to these guidelines. The choice of rivaroxaban in this patient with suspected malignancy-associated thrombosis and potential hepatic dysfunction was supported by formal risk scoring. The Child-Pugh score was 6 points (Class A), indicating preserved hepatic function and confirming the absence of contraindication to rivaroxaban use. The HAS-BLED score was 2, corresponding to a low haemorrhagic risk. Renal function was adequate (eGFR 52.99 mL/min, above the 30 mL/min contraindication threshold for rivaroxaban). These assessments, combined with a normal coagulation profile

(INR 0.9, prothrombin ratio >70%, platelets 300,000/mm^3), justified the use of rivaroxaban rather than low molecular weight heparin, the latter presenting significant adherence and cost barriers in this resource-limited setting.

The persistence of the thrombus at day 14 is not unexpected given the mechanical nature of the obstruction and the underlying oncological context. Catheter-directed thrombolysis or pharmacomechanical thrombectomy can be considered in acute IVC thrombosis presenting within 14 days of symptom onset, in patients with low bleeding risk [12]. Our patient would have been a candidate for this approach on admission; however, the unavailability of such facilities in the Republic of Congo necessitated international referral, introducing a significant delay that may have adversely affected outcomes.

The patient's sudden death one month after thrombectomy raises several clinical considerations. The most plausible hypotheses include: recurrent thromboembolism precipitated by anticoagulant non-adherence (particularly relevant in a patient with advanced oncological disease and limited healthcare access); tumour progression with direct cardiac or vascular involvement; or a primary cardiac event in the context of pre-existing structural heart disease. The absence of autopsy precludes definitive attribution of cause of death.

3.4. Clinical Limitations

At the patient level, this case demonstrates that TTE via the subcostal window is sufficient for diagnosis of juxtaright atrial IVC thrombosis when cross-sectional imaging is unavailable, and that DOAC initiation is feasible with limited biological data provided renal function is known and overt hepatic failure is clinically excluded.

At the system level, this case exposes four specific structural shortcomings. First, the diagnostic pathway was not expedited: the patient consulted only 10 days after symptom onset, reflecting barriers to early specialist access. Second, the patient had been lost to follow-up since his previous hospitalisation in January 2025, underscoring the absence of structured recall systems for high-risk patients. Third, DOACs are prohibitively expensive in this context and require long-term use given the underlying hepatic malignancy—which itself demands oncological treatment—placing an unsustainable financial burden on a patient of modest socioeconomic means. Fourth, the indicated thrombectomy could only be performed four months later in Morocco due to the absence of local interventional vascular infrastructure, a delay that likely allowed thrombus organisation to progress and may have contributed to the fatal outcome. These failures underscore the urgent need for regional interventional capacity and cross-border care coordination protocols in sub-Saharan Africa.

3.5. Limitations

Several limitations of this case report must be acknowledged. First, histological confirmation of hepatocellular carcinoma was not obtained; the oncological diagnosis remains presumptive. Second, advanced imaging (CT venography, MRI)

was not performed, precluding formal characterisation of the IVC thrombus and evaluation of potential tumour thrombus. Third, thrombophilia screening, D-dimer levels, and coagulation biomarkers were not systematically reported. Fourth, the cause of death remains undetermined in the absence of autopsy. Fifth, the international transfer for thrombectomy introduced a therapeutic delay of approximately three months, during which thrombus organisation may have progressed. These limitations reflect the structural constraints of sub-Saharan African healthcare systems rather than individual clinical decisions, and underscore the importance of international advocacy for improved diagnostic and therapeutic infrastructure.

4. Conclusion

IVC thrombosis extending to the juxtaright atrial segment is a rare and potentially fatal condition requiring prompt diagnosis and management. In resource-limited settings, TTE using the subcostal window offers a pragmatic and reliable alternative to MRI and CT for thrombus detection and haemodynamic assessment. The coexistence of prolonged immobilisation and suspected hepatocellular carcinoma in this patient illustrates the multi-factorial thrombogenic pathophysiology frequently encountered in this clinical context. Early anticoagulation with DOACs, in line with current ESVS guidelines, should be initiated without delay. The development of interventional vascular surgery capacities within sub-Saharan African tertiary centres is urgently needed to prevent avoidable deaths related to diagnostic and therapeutic delays. Systematic echocardiographic assessment should be considered in patients presenting with bilateral lower-limb oedema and an elevated thromboembolic risk profile.

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Patient Consent

Written informed consent for publication of this case and the accompanying echocardiographic image was obtained from the patient's family, given the patient's death prior to manuscript preparation. The authors confirm that all personal identifiers have been removed or disguised to protect patient anonymity.

Conflicts of Interest

The authors declare no conflicts of interest with respect to the research, authorship, or publication of this article.

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