



## Case report

## Renal vein thrombosis in the course of non-operative treatment of kidney trauma: A rare case report



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## ABSTRACT

**Introduction:** Venous thromboembolism is widely recognized as a life-threatening complication in trauma, yet renal vein thrombosis (RVT) following trauma is particularly rare.

**Presentation of case:** We report a case of a 67-year-old man who was brought to the emergency department after falling down a 14-step staircase at home which presented right kidney trauma (parenchyma laceration with a perirenal hematoma) on computed tomography, and hematuria. Considering the patient's hemodynamic stability, a non-operative treatment was initiated, and the patient was referred to the intensive care unit for close observation. On post-trauma day 3, a repeated CT revealed right renal vein thrombosis. After evaluation, it was decided to maintain prophylactic anticoagulation doses of enoxaparin (40 mg/day) due to the elevated risk of bleeding in high-grade renal trauma and planned an inferior vena cava (IVC) filter placement. In the following days, the hematuria resolved spontaneously and an IVC filter was placed. The patient progressed with no complaints, spontaneous diuresis, improvement in laboratory parameters, and cardiovascular stability, which led to his discharge on day 12 with rivaroxaban 10 mg/day. The patient was successfully treated with a non-operative approach, and the RVT disappeared after 35 days.

**Discussion:** Post-traumatic renal vein thrombosis is a rare occurrence, and due to the infrequent nature of these events, specific management guidelines are not fully established, particularly when thrombosis is confirmed in an acutely injured patient.

**Conclusion:** Conservative therapy seems to play a meaningful role in trauma-related renal vein thrombosis treatment.

## 1. Introduction

Venous thromboembolism (VTE) is widely recognized as a life-threatening complication in trauma [1,2]. It poses as one of the principal causes of death in victims who survive the first 24 h after the primary injury [1,2]. The incidence of deep vein thrombosis (DVT) can reach up to 58 % in trauma patients without prophylaxis and approximately 31 % of patients undergoing chemoprophylaxis with low-molecular-weight heparin (LMWH) [3]. However, renal vein thrombosis following trauma is particularly rare [4,5]. Herein, we present a case of renal vein and inferior vena cava (IVC) thrombosis in the course of a non-operative treatment of a blunt trauma in an adult patient, and

this work has been reported in line with the 2023 SCARE criteria [6].

## 2. Case report

A 67-year-old man was brought to the emergency department after falling a 14-step staircase at home. He only complained of left hemithorax pain. His past medical history was insignificant. At admission, vitals were stable, the patient was alert, the physical examination was unremarkable, and laboratory results were normal. Contrast-enhanced abdominal computed tomography (CT) scan showed areas of hypo-enhancement in the right renal parenchyma, implying laceration, associated with a perirenal hematoma measuring approximately 8.0 × 6.0

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cm, extending towards the renal collecting system, with no evidence of contrast medium extravasation. Head and chest CT showed no significant abnormalities.

Considering the patient's hemodynamic stability, a non-operative treatment approach was initiated, an indwelling urinary catheter was placed for monitoring urine output, and the patient was referred to the intensive care unit for close observation. No antibiotics, stents, or transfusions were required. The patient presented episodes of hematuria and fluctuations in the hemoglobin level in the following days (nadir of 8 mg/dL on day 5), yet maintained normal renal function and hemodynamic stability, without receiving any blood transfusion. Due to persistent hematuria, a repeated contrast CT scan on day 3 was performed revealing thrombosis at the confluence of the right renal vein with the inferior vena cava (Fig. 1), and the injury was diagnosed as a right renal trauma AAST grade IV. After evaluation, it was decided to maintain prophylactic anticoagulation doses of enoxaparin (40 mg/day) due to the elevated risk of bleeding, and the surgical team planned an inferior vena cava (IVC) filter placement. In the following days, the hematuria resolved spontaneously, an IVC filter was placed, and, after consideration, we opted for maintaining prophylactic doses of enoxaparin (40 mg/day).

The patient progressed with no complaints, spontaneous diuresis, improvement in laboratory parameters, and cardiovascular stability, which led to his discharge on day 12 with rivaroxaban 10 mg/day. A follow-up abdominal CT scan performed 35 days post-injury revealed virtually complete resolution of the right kidney hematoma (now  $3.7 \times 2.1$  cm), and right renal vein thrombosis displayed complete resolution (Fig. 2). Three months after the incident, the patient was readmitted to our hospital to remove the IVC filter. Anticoagulation with rivaroxaban 15 mg twice daily was reintroduced 24 h after the procedure and treatment continued for one more month. On clinical follow-ups, the patient persisted asymptomatic and was discharged from surgical follow-ups after 6 months.

### 3. Discussion

Thrombosis in trauma patients is a challenging clinical entity for any care team due to the complex decision-making based on risk assessment of bleeding versus pulmonary embolism (PE) [7]. The intense metabolic response, immobilization leading to venous stasis, reduced levels of endogenous anticoagulants, endothelial damage, diminished fibrinolysis, and vessel wall dysfunction favor hypercoagulability and impose a high risk for DVT and PE in major trauma patients, even after discharge [2,7,8]. Despite the substantial morbimortality related to VTE and the advances made in its prevention, the prophylaxis and treatment are not yet entirely comprehended, and there remains a significant lack of clear guidelines for trauma patients [5,9]. The competing demands of balancing the immediate initiation of VTE prophylaxis while avoiding increasing the risk or the re-occurrence of bleeding in trauma patients

are incompletely addressed by current literature [8,10]. We reported a case of renal vein thrombosis (RVT) overlapped with a renal hematoma after blunt trauma, which makes management more delicate since the hematoma itself can induce local thrombosis, and the treatment for each condition may worsen the other.

Trauma is accountable for 12 % of all cases of VTE in the general population [2], and trauma of the kidney is a well-established risk factor for renal venous thromboembolism, yet, as aforementioned, renal vein thrombosis after trauma is exceedingly unusual [5,9]. Renal trauma represents 3 % to 5 % of all emergency admissions to trauma centers globally [5,11] and post-traumatic RVT is often present in the circumstances of renal trauma accompanied by vascular or parenchymal injury, which implies AAST grade III or greater [9,11].

Due to the rare nature of post-traumatic RVT occurrences, specific management guidelines are not fully established [4,9]. The major treatment goals are kidney function preservation and prevention of embolism of the thrombus or PE [2,9]. Currently, most cases can be managed successfully with non-operative treatment, avoiding unnecessary surgeries and nephrectomies [11]. The clinical presentation of RVT, regardless of the etiology, may range from asymptomatic patients to symptoms of lumbar pain, hematuria, nausea, vomiting, and even acute kidney failure or PE [4,9]. Approximately 33 % of VTE episodes in trauma manifest as PE with or without DVT [8]. Although the acknowledged elevated risk of post-trauma VTE, relevant variability in clinical practice still exists [2,8,12].

A recent report published by the American Association for the Surgery of Trauma (AAST) and the American College of Surgeons (ACS) has shown that blunt solid organ injury may induce a hypercoagulable phenotype as early as 12 h post-injury [8]. To avert poor outcomes, the 2023 Consensus Conference to Implement Optimal VTE Prophylaxis in Trauma endorsed the optimal and safe time to initiate pharmacological prophylaxis between 24 and 48 h after hospital admission, once clinical and radiographic injury stability is confirmed [10]. This blunt trauma cases approach has been correlated with lower DVT and PE rates without increasing the risk of bleeding, transfusion necessity, failure of non-operative management, or mortality [8,10]. Nonetheless, there are no guidelines for when a trauma patient demands full anticoagulation doses, which leaves a lack of evidence in the literature on how to proceed when VTE is confirmed in an acutely injured patient.

A 36,187-patient retrospective study carried out with data from the ACS between 2013 and 2014 demonstrated that chemoprophylaxis initiated in 48 h or less after blunt solid organ injuries for patients undergoing non-operative management reduced DVT (1.9 % vs. 4.1 %) and PE (1.0 % vs. 1.8 %) rates compared to late prophylaxis (>48 h) [8,13]. There is no strict consensus regarding optimal VTE pharmacologic prophylaxis strategies between the trauma and surgical care teams. Protocols may differ across institutions, yet enoxaparin is the drug of choice for chemoprophylaxis in most of the literature [7,8]. Despite the common use of enoxaparin 40 mg per day for prophylaxis, in 2023, the



Fig. 1. Contrast-enhanced computed tomography images revealing thrombosis (arrow) at the confluence of the right renal vein with the inferior vena cava.



**Fig. 2.** Contrast-enhanced computed tomography images performed 35 days post-injury revealing complete resolution of the right renal vein thrombosis.

AAST and the ACS recommend a novel approach to enoxaparin, with 40 mg twice daily for most trauma patients since lower doses may lead to inadequate pharmacologic prophylaxis and exhibit a higher VTE rate [3,8]. However, this is not yet common practice in trauma centers worldwide. The current recommendation is to continue long-term anticoagulation for a minimum of 6 months in cases of RVT post-blunt trauma [9].

Furthermore, new pharmacological strategies for VTE have been presented recently, such as the use of direct oral anticoagulants (DOACs) [3]. DOACs have been routinely prescribed in current medical practice for stroke prevention, heart valve disease, thromboembolic prophylaxis in orthopedic surgeries, and have been also assessed for trauma patients [14]. Rivaroxaban, an orally taken medication and direct binder to factor Xa, has been associated with an absolute risk reduction for DVT, nonfatal PE, and death compared to LMWH 40 mg once daily [12]. Moreover, DOACs use can be resumed in therapeutic dosages 24 h after surgical interventions with minimal risk of hemorrhage, and some authors propose even shorter periods of 6 to 8 h after procedures [14].

The patient herein reported presented a renal hematoma and, while the hematoma itself does not configure an absolute contraindication for anticoagulation, full doses of anticoagulation therapy in these cases have not been safely tested like prophylactic doses of LMWH [3,8]. The literature does not yet substantially support which treatment to adopt for acute trauma patients with VTE. A controversial issue in these cases may be the use of an IVC filter. Current literature suggests not to routinely place IVC filters for PE prophylaxis in severe trauma patients, except in cases with a high risk of thromboembolic complications and if there are ongoing contraindications to full anticoagulation, such as the case presented [3,8]. When an IVC filter is placed, the care team should structure a follow-up schedule to remove the filter and resume anticoagulation [3,7,8].

#### 4. Conclusion

RVT after blunt trauma is a rare event with challenges related to its management. The duality of the binomial hematoma and thrombosis coexistence after a kidney trauma in our patient portrays an intriguing treatment discussion yet to be established in the medical literature. The patient was managed successfully with an IVC filter and prophylactic doses of enoxaparin. Despite the limited literature on new anticoagulants, DOACs seem to represent promising prophylaxis agents for trauma patients. We observed that in cases in which trauma-related thrombosis deviates from the usual scenarios, such as post-traumatic RVT, there seems to be space for better standardization of conducts, constituting grounds for performing robust primary research on this issue, which will provide more appropriate knowledge for guiding professionals in trauma services and emergency departments worldwide.

#### Ethical approval

Ethical approval was not required from an Ethics committee for reporting single-patient cases. This report does not contain any personal information that could lead to identification of the patient.

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#### Author contribution

**João Henrique Fonseca do Nascimento:** Conceptualization; Visualization; Writing - original draft; Writing - review & editing; Proofreading.

**André Bouzas de Andrade:** Writing - review & editing; Proofreading.

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**André Gusmão-Cunha:** Conceptualization; Supervision; Visualization; Writing - original draft; Writing - review & editing; Proofreading.

**Gabriel Schnitman:** Conceptualization; Supervision; Visualization; Writing - original draft; Writing - review & editing; Proofreading.

#### Guarantor

Gabriel Schnitman

#### Research registration number

N/A

#### Informed consent

Written informed consent was obtained from the patient for publication and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

#### Conflict of interest statement

No conflict of interest for any author concerning this article.

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