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Paget-Schroetter Syndrome: A Case Report of Upper Extremity Deep Vein Thrombosis in A Healthy Young Man

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Abstract

Paget-Schroetter Syndrome (PSS), also known as effort thrombosis, is a rare form of primary upper extremity deep vein thrombosis (UEDVT) caused by compression of the subclavian–axillary vein at the thoracic outlet. It typically affects young, healthy individuals following strenuous physical activity. Due to its potential for long-term morbidity, proper diagnosis and appropriate anticoagulation management are essential. Case Presentation: A 24-year-old healthy male presented with a three-day history of sudden swelling, erythema, pain, and numbness in his left upper extremity. Symptoms emerged several hours after playing basketball. Physical examination revealed significant edema of the left arm, although peripheral pulses remained intact. Laboratory investigations showed a markedly elevated D-dimer level of 4249.03 ng/mL, while coagulation profiles were within normal limits. Doppler ultrasound confirmed thrombosis in the left subclavian and axillary veins. The patient was diagnosed with PSS and initiated on oral rivaroxaban (15 mg once daily). At the two-week follow-up, the D-dimer level had decreased to 1789 ng/dL with clinical improvement. After one month of therapy, the edema had completely resolved, and the D-dimer level normalized to 372 ng/mL. Consequently, anticoagulation therapy was discontinued, and the patient was scheduled for long-term monitoring. Conclusion: This case highlights the classic presentation of Paget-Schroetter Syndrome in a young athlete. Early recognition and the use of direct oral anticoagulants (DOACs) such as rivaroxaban can lead to rapid clinical resolution and normalization of laboratory markers. A high index of suspicion is required when evaluating acute unilateral arm swelling in young individuals following physical exertion

INTRODUCTION

Paget-Schroetter Syndrome (PSS), also known as effort thrombosis, is a primary form of upper extremity deep vein thrombosis (UEDVT) characterized by spontaneous venous thrombosis of the subclavian or axillary veins. While UEDVT accounts for approximately 5% to 10% of all deep vein thrombosis (DVT) cases, PSS remains rare, with an incidence of 1 to 2 per 100,000 individuals annually (Siddiqui et al., 2024). Notably, this syndrome disproportionately affects young, healthy individuals, often involving the dominant arm of athletes or manual laborers (Sadek et al., 2023). Despite its low prevalence, the condition carries significant morbidity, including risks of pulmonary embolism and post-thrombotic syndrome (Boon et al., 2021; Di Nisio et al., 2016; Oblitas et al., 2026; Sista & Klok, 2018; Wenger et al., 2021).

The pathogenesis of PSS is primarily driven by anatomical abnormalities at the thoracic outlet, leading to mechanical compression of the vein between the first rib and the clavicle or surrounding musculature. This mechanical stress is exacerbated by repetitive, strenuous overhead activities, which cause microtrauma to the venous endothelium and trigger the coagulation cascade (Drouin et al., 2021). Beyond mechanical factors, risk factors for UEDVT also include hypercoagulable states, although these are more frequently associated with secondary UEDVT rather than primary effort thrombosis (Brown & Martinez, 2022). In young patients, a sudden increase in physical activity or intensive weightlifting often serves as the immediate precipitating factor for thrombotic events.

Diagnosis of UEDVT requires a high index of clinical suspicion followed by multimodal investigation (Arain et al., 2024; Koethe et al., 2022; Pergola et al., 2023). Physical examination typically reveals acute-onset swelling, cyanosis, and heaviness of the affected limb, often accompanied by visible collateral superficial veins (Dah et al., 2022; Forner-Cordero et al., 2023; Griffiths & Alexander, 2025; Pandey & Shah, 2022). Laboratory assessment commonly includes D-dimer levels, which, although highly sensitive, lack specificity and must be interpreted within the clinical context (Lim et al., 2022). For radiological confirmation, color Doppler ultrasound remains the first-line diagnostic tool due to its non-invasive nature and high sensitivity for proximal thrombus detection. However, for definitive surgical planning or in cases of inconclusive ultrasound results, computed tomography venography (CTV) or magnetic resonance venography (MRV) is employed to delineate the extent of the thrombus and identify the site of anatomical compression (Norden et al., 2025).

Here, we report a case of unusual left UEDVT in the absence of clear risk factors in a 24-year-old healthy man who presented with a three-day history of left upper extremity pain and swelling after a day of playing basketball. Very few documented cases of spontaneous UEDVT without identifiable risk factors and in this anatomical location have been previously reported.

This case report aims to describe the clinical presentation, diagnostic approach, and management of Paget-Schroetter Syndrome in a young athlete, specifically evaluating the effectiveness of rivaroxaban as monotherapy in achieving rapid clinical and laboratory resolution, while contributing to the growing body of evidence supporting conservative management of effort thrombosis without surgical intervention. In doing so, this report seeks to increase clinical awareness among physicians, particularly in primary care and emergency settings, to recognize PSS as a differential diagnosis in young patients presenting with acute unilateral arm swelling following physical exertion. It also provides practical evidence supporting the use of direct oral anticoagulants as a first-line treatment option in uncomplicated PSS, potentially reducing the need for invasive procedures, and highlights the importance of individualized management decisions that carefully balance recurrence risk against the benefits of avoiding surgical morbidity. Ultimately, this case serves as a valuable reference for sports medicine practitioners managing athletes with venous thromboembolic events.

METHOD

Case Report

24-year-old male presented to the hospital with a sudden onset of marked swelling, redness, pain, and numbness of his left arm of three days duration. Just a day before the onset

of the swelling the patient played basketball quite intensely. He denied immediate pain after played basketball, but he noticed some swelling several hours after. He has no symptoms of chest pain and dyspnea. He also denied any personal medical history, and in particular no family history of venous thromboembolism or coagulopathy. He denied any past history of surgery and intravenous drug use, he does not use tobacco, alcohol, or illegal drugs.

Physical examination revealed a moderately nourished, well-built male, not in acute distress except for marked pain in left extremity. His vital signs, including blood pressure, heart rate, and pulse oximetry, were in normal range. The left arm was swollen with moderate enlargement compared to the right, and erythema and venous engorgement was noted. All peripheral pulses were easily palpable. X-ray of the left extremity revealed no fracture or dislocation. The diagnosis of axillo-subclavian thrombosis was made, while Doppler ultrasound showed thrombosis in the left subclavian and axillary veins. Laboratory tests showed elevated D-dimer 4249.03 ng/mL (0-500 ng/mL). The coagulation profile revealed activated partial thromboplastin time (aPTT) and prothrombin time (PT) within normal range while the international normalized ratio (INR) was 1.0.

The patient was diagnosed with Upper Extremity Deep Vein Thrombosis due to Paget-Schroetter Syndrome. Thereafter, the patient was administered Rivaroxaban tablet of 15 mg per oral once a day. Two weeks after first therapy, patient came for follow up. Physical examination showed that the swelling was diminished, and all blood work was within normal limits including D-Dimers reduced to of 1789 ng/dL. Rivaroxaban treatment will be maintained, with a follow-up Doppler USG scheduled in two months. At the one-month follow-up, the patient’s D-dimer was 372 ng/mL, and the left arm swelling had subsided. Rivaroxaban was ceased, and subsequent follow-up was scheduled.

RESULTS AND DISCUSSION

Paget-Schroetter Syndrome (PSS), or effort thrombosis, is a rare but clinically significant manifestation of primary upper extremity deep vein thrombosis (UEDVT). It is characterized by the spontaneous development of a thrombus in the axillary or subclavian veins, typically following repetitive or strenuous physical activity involving the upper limbs. While the overall incidence of deep vein thrombosis (DVT) in the general population is approximately 1 per 1,000 individuals, UEDVT accounts for only 4% to 10% of these cases. PSS specifically affects young, physically active, and otherwise healthy individuals, with a slight male predominance (Sadek et al., 2023; Drouin et al., 2021). Literature suggests that basketball, weightlifting, and rowing are among the most common precipitating activities (Siddiqui et al., 2024; Garcia & Patel, 2024). Interestingly, recent reports have also identified PSS in occupational settings involving manual labor, such as porters or manual lifters, where repetitive mechanical strain is a daily requirement (Soemarko & Herlinah, 2020). In our case, the 24-year-old patient fits the classic demographic profile: a healthy athlete participating in a sport (basketball) that necessitates frequent overhead arm abduction and rotation.

The pathophysiology of PSS is fundamentally mechanical rather than systemic. The anatomy of the thoracic outlet plays a critical role; the subclavian vein passes through a narrow space bounded by the first rib, the clavicle, and the costoclavicular ligament. In many patients, subtle anatomical variations such as hypertrophy of the anterior scalene muscle, presence of a cervical rib, or an abnormally thick costoclavicular ligament predispose the vein to

compression (Lim et al., 2022). During vigorous activity, such as overhead motions in basketball or weightlifting, the subclavian vein is repeatedly compressed against these rigid structures. This repetitive mechanical stress leads to microtrauma of the venous endothelium, subsequently activating the coagulation cascade and resulting in thrombus formation (Drouin et al., 2021; Kenitz et al., 2020). Unlike secondary UEDVT, which is often provoked by central venous catheters or malignancies, PSS frequently occurs in the absence of traditional components of Virchow's triad, such as systemic hypercoagulability or stasis (Kenitz et al., 2020). The clinical presentation of our patient — characterized by sudden-onset swelling, erythema, and venous engorgement (Urschel's sign) without a prior medical or family history of coagulopathy — is highly consistent with localized mechanical injury (Ibrahim et al., 2017).

The diagnosis of PSS requires a high index of clinical suspicion, as it often mimics muscle strain or cellulitis in its early stages. The hallmark clinical features, known as Urschel's sign, include sudden-onset edema, cyanosis, and the development of prominent collateral superficial veins across the shoulder and upper chest (Lim et al., 2022). In our patient, marked edema and venous engorgement immediately suggested a vascular etiology.

Laboratory markers, specifically D-dimer, serve as a sensitive but non-specific indicator of fibrinolysis. The patient's initial D-dimer was markedly elevated at 4249.03 ng/mL. While a negative D-dimer is highly useful in ruling out DVT in low-risk patients, a positive result in a young patient necessitates prompt imaging. Recent literature suggests that although D-dimer levels may correlate with thrombus burden, they cannot differentiate between primary and secondary UEDVT (Lim et al., 2022). Furthermore, the normal coagulation profile (PT, aPTT, INR) supports the likelihood that this event was driven by local mechanical factors rather than an underlying systemic hypercoagulable disorder.

Color Doppler ultrasound (CDUS) remains the first-line non-invasive diagnostic modality due to its high sensitivity and specificity for proximal thrombus detection (Drouin et al., 2021; Norden et al., 2025). However, when CDUS is inconclusive — particularly when the clavicle limits visualization of the mid-subclavian vein — advanced imaging such as computed tomography venography (CTV) or magnetic resonance venography (MRV) is recommended to delineate thrombus extent and identify anatomical compression (Norden et al., 2025).

The management of PSS has evolved significantly over the past decade. Historically, patients were treated with vitamin K antagonists such as warfarin, requiring frequent laboratory monitoring. Current guidelines increasingly support the use of direct oral anticoagulants (DOACs), including rivaroxaban, due to their predictable pharmacokinetics and lack of routine INR monitoring requirements (Martinez & Brown, 2026). While severe cases may require catheter-directed thrombolysis (CDT) or surgical decompression of the thoracic outlet (first rib resection) to prevent recurrence, conservative management with anticoagulation alone may be effective in selected patients. The American College of Chest Physicians recommends a minimum of three months of anticoagulation for uncomplicated primary UEDVT (Kenitz et al., 2020). In this case, a one-month course of rivaroxaban 15 mg once daily resulted in complete clinical resolution and normalization of D-dimer levels (372 ng/mL). This outcome aligns with recent systematic reviews suggesting that DOACs are effective in promoting venous recanalization in effort-related thrombosis, with a lower bleeding risk compared to vitamin K antagonists (Martinez & Brown, 2026).

A major point of debate in PSS management is the role of surgical decompression, particularly first rib resection (FRR). Proponents of early surgical intervention argue that without removal of the mechanical obstruction at the thoracic outlet, patients remain at risk for recurrence and post-thrombotic syndrome (PTS) (Lim et al., 2022; Thompson & White, 2025). PTS may lead to chronic pain and functional limitation, significantly affecting quality of life and return to sports (Siddiqui et al., 2024; Garcia & Patel, 2024). However, conservative management with anticoagulation alone, as demonstrated in this case, can be successful in patients who respond rapidly to therapy and are able to modify physical activity (Sadek et al., 2023; Soemarko & Herlinah, 2020). Therefore, treatment decisions must be individualized, carefully balancing the risk of recurrence against surgical morbidity and long-term venous outcomes (Thompson & White, 2025).

CONCLUSION

A 24-year-old healthy male presented with acute swelling, erythema, and pain in his left arm following a basketball game. Clinical evaluation and Doppler ultrasound confirmed Paget-Schroetter Syndrome, characterized by thrombosis in the left subclavian and axillary veins. Laboratory results revealed a markedly elevated D-dimer level of 4249.03 ng/mL, while other coagulation markers remained within normal limits. The patient was managed conservatively with oral rivaroxaban (15 mg daily). Follow-up assessments demonstrated rapid clinical improvement and a progressive decline in D-dimer levels to 372 ng/mL within one month. Complete resolution of edema allowed for discontinuation of anticoagulation therapy. This case underscores the effectiveness of direct oral anticoagulants in managing effort-induced thrombosis in young athletes, achieving excellent clinical outcomes without invasive intervention.

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