

# Plantar vein thrombosis: an uncommon cause of plantar foot pain

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## ABSTRACT

**Introduction:** Plantar vein thrombosis is a rare condition that can lead to pain, edema, and walking difficulties. It presents a series of predisposing factors, such as recent surgeries, the use of oral contraceptives, and local trauma, among others. Imaging tests are essential for the right diagnosis, and ultrasonography is the modality of choice. As for treatment, there is no consensus in the literature. **Report:** Case of a 30-year-old patient who sought emergency medical care complaining of sudden severe pain in the plantar region of her right foot with walking difficulties. On physical examination, hyperalgesia was observed in the plantar region, irradiating to the calf, associated with swelling. Color Doppler imaging identified an acute thrombus in the medial plantar vein. Rivaroxaban was initially prescribed and replaced by acetylsalicylic acid after three months. The treatment was effective, and the patient was discharged after 11 months. **Conclusion:** Plantar vein thrombosis is a rare condition and has a wide range of differential diagnoses so physicians must maintain a high level of clinical suspicion. To improve diagnosis and treatment, it would be necessary to include plantar veins in the investigation protocols of patients suspected of having Deep Venous Thrombosis, besides additional clinical research for improving treatment.

**Keywords:** venous thrombosis; ultrasonography; anticoagulants.

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## INTRODUCTION

The plantar veins are an uncommon site of involvement in the deep venous system, which makes thrombosis of these structures a rare and underdiagnosed condition, with less than 100 cases published in the current medical literature<sup>1,2</sup>. The disease is characterized by severe pain in the plantar region, which may be associated with local edema and difficulty in walking<sup>3,4</sup>.

This pathology brings as main risk factors recent surgeries, use of oral contraceptives, local trauma, long and recent trips, obesity, thrombophilias, and paraneoplastic syndromes<sup>4,5</sup>.

The clinical diagnosis of plantar vein thrombosis (PVT) is difficult, as it is characterized by nonspecific pain, and must be differentiated from other pathologies such as: plantar fasciitis; intermetatarsal bursitis; Morton's neuroma; sesamoiditis; stress fracture and tendon pathology<sup>6</sup>.

Imaging exams are essential in the diagnosis of this pathology, and the most used is the echo doppler. However, MRI can also be useful to rule out other pathologies of the plantar region<sup>1,3,6</sup>.

There is no consensus on the treatment of PVT, with some authors preferring the use of nonsteroidal anti-inflammatory drugs, while others prescribe only anticoagulation<sup>1,4,5</sup>.

We present the case of a young patient diagnosed with thrombosis of the medial plantar vein who underwent successful clinical treatment.

## REPORT

F. R., 30 years old, female, sought emergency medical care with a complaint of sudden, severe pain, which began in the early morning on the plantar region of the right foot with difficulty walking. The patient denied smoking, chronic diseases, surgeries, or recent trips. Her BMI was 27.5. She was taking continuous oral contraceptives (gestodene + Ethinyl estradiol) and reported having run 6 km two days before the onset of symptoms.

On physical examination, hyperalgesia could be observed in the plantar region, irradiating to the calf, associated with calf swelling. Color Doppler ultrasound of the venous system of the right lower limb was requested, which showed that in the superficial venous system the great and small saphenous veins had preserved caliber and were compressible. As for the deep venous system, it was possible to demonstrate that it was patent, and compressible, with the phasic flow to respiratory movements, except for the presence of acute thrombus in the medial plantar vein.

As non-pharmacological measures, seven days of absolute rest and 30 days without physical activities were prescribed, and the use of 20/30 mmHg compressive stockings was advised when performing such practices after this period. In addition, Xarelto 20 mg was prescribed once a day for six months, and, at the end of this period, acetylsalicylic acid 100 mg was started for three months. The patient progressed well and was discharged 11 months after the beginning of treatment.

## DISCUSSION

Plantar vein thrombosis is a rare cause of plantar pain, with less than 100 cases described in the literature<sup>1</sup>. Despite being little diagnosed and described, Thomas and O'Duyer<sup>2</sup>, in a study composed of 100 patients with suspected venous thrombosis or pulmonary thromboembolism, described that 31% had the condition, concluding that this, is a more common condition than previously thought, but underdiagnosed. Its prevalence is higher in women (63.6%), with a mean age of 58.2 years<sup>5</sup>.

The medial and lateral plantar veins originate from the deep plantar arch, run deep into the sole adjacent to the corresponding arteries, and after communicating with the saphenous veins, unite to form the posterior tibial vein at the medial malleolus<sup>3</sup>. The lateral plantar vein has a larger diameter, greater extension, and a wider pedicle and is located between muscle layers, accounting

for most of the drainage of the deep region of the sole of the foot<sup>4</sup>. Thus, it is the main one affected by thrombosis, being affected in 95.5% of the cases. The medial plantar vein is affected in 40.9%, but only 6% in an isolated way<sup>5</sup>.

The clinical picture of plantar vein thrombosis is nonspecific and is characterized by pain in the plantar region of moderate to intense intensity, besides edema of the affected foot and difficulty walk<sup>5</sup>. Barros and Labropoulos<sup>3</sup>, in a study that evaluated 11 patients with plantar thrombosis, reported that all of them presented pain and eight, edema<sup>6</sup>. Thus, it is necessary to maintain a high level of suspicion when evaluating patients complaining of acute onset plantar pain<sup>7</sup>.

Plantar pain is a common complaint and can be caused by a wide range of disorders, such as plantar fasciitis, plantar fibromatosis, tendon disorders, bursitis, stress fractures, Morton's neuroma, sesamoiditis, ganglionic cysts, among others<sup>8</sup>. Plantar fasciitis is the main cause of pain in the plantar region, and it is caused by repetitive microtraumas that lead to the degeneration of the fascia and is characterized by exacerbated pain when stepping and when pressing the calcaneus. At the ultrasound, thickening and hypoechogenicity of the fascia can be observed<sup>9</sup>. Another important condition is plantar fibromatosis, characterized by fibrous tissue growth in the fascia, which generates pain and the appearance of a fusiform nodule in the plantar region, which can be identified by ultrasonography<sup>10</sup>.

The etiology is not fully explained and 50% of cases are idiopathic<sup>5</sup>. However, several factors can predispose and act as causal agents for the affection, such as trauma, paraneoplastic syndromes, post-surgical state, thrombophilias, immobilizations, and use of contraceptives<sup>11</sup>. Trauma in the plantar region is an important factor that was identified in 37% of the cases in the cohort of Czihal et al.<sup>6</sup> This is because the tension in the plantar region, especially in a repetitive manner, generates lesions in the intima of the veins, predisposing them to thrombosis<sup>5</sup>. Contraceptives have been described for years as potential precipitating factors of thrombosis episodes, which is corroborated by the study of Barros and Labropoulos<sup>3</sup>, in which 36% of PVT patients were using these hormones<sup>6</sup>. Other prominent causes that require more detailed investigation are thrombophilias and paraneoplastic syndromes, and the investigation of the latter becomes mandatory when faced with patients over 50 years of age, especially if there are no other associated causal factors<sup>12</sup>.

Imaging tests are essential for the diagnosis of plantar venous thrombosis<sup>7</sup>. In this context, ultrasound is the exam of choice<sup>6,12</sup>, because it is an accurate, inexpensive, and accessible method<sup>5</sup>, with the main findings being ectasia of the affected plantar vein, hypoechoic intraluminal thrombus, loss of vascular compressibility, and no flow at Doppler<sup>11</sup>. However, it is examiner-dependent, and assessment of plantar vessels is not included in most deep vein thrombosis investigation protocols, which may

explain the underdiagnosis<sup>5</sup>. MRI is not mandatory, but may help in cases of diagnostic doubt, obese patients, rule out differential diagnoses, and investigate the extent of thrombosis. In this exam, it is mainly observed flow reduction, edema of the adjacent region, and perivenular enhancement<sup>1,13</sup>. In addition to imaging tests, the D-dimer can be useful to exclude low-risk cases, but one should take into account the possible false-positive results in elderly and patients with rheumatoid arthritis, hypertriglyceridemia, hyperbilirubinemia or hemolysis due to inadequate collection<sup>12</sup>.

As for treatment, there is no consensus in the literature<sup>6,7</sup>. Czinhal et al.<sup>6</sup> recommended in their cohort the use of anticoagulants for 4 to 6 weeks<sup>4</sup>. The American College of Thoracic Surgeons recommends the choice between conventional treatment (one type of heparin followed by a vitamin K antagonist) or the use of the new oral anticoagulants (rivaroxaban, apixaban, edoxaban, and dabigatran) for a period that can extend for 3 to 6 months or indefinitely in the existence of thrombophilia<sup>14</sup>.

In the case reported here, we chose to use rivaroxaban, which has the following benefits: oral administration, stable pharmacokinetics and pharmacodynamics, less drug and food interaction, little variation with individual characteristics, the possibility of fixed doses, no need for control laboratory tests and lower risk of bleeding, with effectiveness comparable to the conventional

scheme<sup>15</sup>. In addition to pharmacological therapy, the use of compression stockings has proved important in helping to reduce symptoms<sup>14</sup>.

The most important complications are the progression to the proximal veins<sup>5</sup> and the occurrence of pulmonary thromboembolism<sup>7</sup>. In the study by Barros and Labropoulos<sup>3</sup>, of the 11 patients diagnosed with PVT, eight had isolated thrombosis in these veins, two had the posterior tibial vein affected, and one had the great saphenous vein affected. Another finding of this study was that in 6 months, there was partial recanalization in nine patients and complete recanalization in two<sup>6</sup>. Moreover, PVT recurrence is not uncommon, with a rate of 27%<sup>5</sup>.

Therefore, plantar vein thrombosis is a rare and underdiagnosed condition, about which a high level of suspicion should be maintained in clinical practice. Moreover, the addition to the investigation protocols of plantar veins in patients with suspected deep vein thrombosis and research on the best therapeutic modality will contribute to an improvement in diagnosis and greater effectiveness and homogeneity in treatment.

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