HAYDARPAŞA NUMUNE MEDICAL JOURNAL

DOI: 10.14744/hnhj.2023.75010
Haydarpasa Numune Med J 2024;64(2):138–142

ORIGINAL ARTICLE

The Radiologic Diagnosis and Result of Endovascular Management of May-Thurner Syndrome

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Abstract

Introduction: This study aims to present the clinical and radiologic findings of 20 cases diagnosed with May-Thurner Syndrome, along with an assessment of radiologic treatment modalities and their outcomes.

Methods: We enrolled 20 patients diagnosed with May-Thurner Syndrome based on radiologic assessments conducted at our hospital's radiology department. Cases with more than 80% iliac vein compression on Multidetector Computed Tomography (MDCT) venography underwent conventional venography for diagnosis confirmation and subsequent endovascular intervention. We analyzed the degree of compression, clinical and radiologic presentations, follow-up imaging, and treatment outcomes.

Results: Among the cases, two were asymptomatic and incidentally discovered. Venous insufficiency was present in various forms: superficial-deep insufficiency in five cases, acute deep vein thrombosis (DVT) in one, chronic DVT in nine, and a combination of superficial-deep insufficiency with chronic DVT in three cases. MDCT venography was performed for all patients. Four patients received endovascular treatment, resulting in patent stents on follow-up MDCT imaging.

Discussion and Conclusion: In patients exhibiting symptoms of venous insufficiency or recurrent DVT in the left lower extremity, considering May-Thurner Syndrome in the diagnostic process is crucial to ensure appropriate treatment and mitigate potential complications. Endovascular intervention represents a viable alternative to surgical approaches, particularly in cases demonstrating significant compression.

Keywords: Diagnosis; May-Thurner Syndrome; Radiology; Treatment.

May-Thurner Syndrome, also known as Iliac Vein Compression Syndrome or Iliocaval Compression Syndrome, is a rare structural variation[1]. Its prevalence in the community is not well established, though some sources report it as 20%[1]. The syndrome occurs due to the compression of the left common iliac vein by the right common iliac artery at the midline of the abdomen, anterior to the lumbar vertebral corpus, where the iliac vessels intersect. Clinical manifestations vary and lack specificity. Patients may be asymptomatic or they may present with signs of venous insufficiency such as edema, venous claudication, varicose veins, stasis ulcers, brownish skin discoloration, and phlebitis in the left lower extremity. Given the risk of venous thrombosis leading to pulmonary embolism in the acute phase and post-thrombotic syndrome in the chronic phase, early diagnosis and

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Submitted Date: 20.07.2022 **Revised Date:** 18.12.2022 **Accepted Date:** 02.01.2023
Haydarpaşa Numune Medical Journal

intervention are crucial. Therefore, May-Thurner syndrome should be considered in the differential diagnosis of left-sided venous insufficiency and/or recurrent deep vein thrombosis (DVT).

This study aims to present the clinical and radiologic findings of 20 patients diagnosed with May-Thurner Syndrome and the outcomes of endovascular treatment.

Materials and Methods

Patients presenting to the outpatient clinic with symptoms such as pain, swelling, discoloration, and varicose veins in the left lower extremity, diagnosed with venous insufficiency, acute-chronic, or recurrent deep vein thrombosis (DVT) by Color Doppler Ultrasonography (CDUS), underwent Multidetector Computed Tomography (MDCT) Venography examinations followed by treatment and monitoring. A total of 20 patients, comprising 13 males and 7 females, with a mean age of 39.75 years (age range: 18-70 years), were retrospectively included in the study, which received approval from the Ethics Committee of Health Sciences University Dr. Siyami Ersek Thoracic Heart and Vascular Surgery Training and Research Hospital (Ethics Committee date/approval number: 21.06.2021/E-28001928-604.01.01). The study was conducted in accordance with the principles outlined in the Helsinki Declaration. Herein, we encompassed patients diagnosed with May-Thurner Syndrome at our hospital between October 2013 and May 2016.

MDCT venography was conducted using a 16-detector CT (Siemens Sensation 16, Siemens Medical Systems, Erlangen, Germany) with a pitch of 16x1.5 mm and 1.5 ml/kg (totaling 150-210 ml) of 350-370 mg/dl non-ionic iodinated contrast medium injected directly into the dorsal veins of the bilateral feet.

For cases demonstrating more than 80% compression on MDCT venography, confirmation of diagnosis and subsequent endovascular treatment were planned using conventional venography. Prior to the procedure, patients were administered 1x75mg clopidogrel and 1x300mg acetylsalicylic acid starting one week in advance. Procedures were conducted via the ipsilateral common femoral vein with the placement of a 12F vascular sheath (Siemens Axiom Artis, Erlangen, Germany). Patients with confirmed stenosis on venographic examination underwent endovascular treatment during the same session. Throughout the procedure, 1 cc heparin was administered, followed by post-dilatation with a stent and an appropriately sized balloon (Eucatech Germany; Powerflex, Johnson & Johnson, USA) to cover the lesion. No procedural complications occurred in any of the cases. Following the procedure, patients were hospitalized for one day and discharged with medical treatment (Clopidogrel 1x75mg for six months and acetylsalicylic acid 1x300mg lifelong).

Results

Two cases were incidental: one was discovered with suspicion of arteriovenous malformation, while the other was identified during MDCT venography conducted with a preliminary diagnosis of thrombus in the inferior vena cava. In the remaining cases, alongside clinical manifestations, left venous insufficiency and findings of acute and chronic DVT were observed on CDUS. None of the cases exhibited pulmonary embolism (Table 1). Iliac vein compression was evident on both CDUS examination (Fig. 1) and MDCT venography (Fig. 2). Endovascular treatment was administered in cases displaying significant compression on conventional venography (Figs. 3 and 4). All patients received

Table 1. Clinical findings and incidence rate of cases

Clinical Finding	Number of cases	Percentage (%)
Incidental	2	10
Venous insufficiency	5	25
Acute DVT	1	5
Chronic DVT	9	45
Venous insufficiency and concomitant chronic DVT	3	15
Pulmonary embolism	0	0

Figure 1. Compression of the right common iliac artery to the left common iliac vein on CDUS (blue arrow: right common iliac artery, yellow arrow: left common iliac vein).

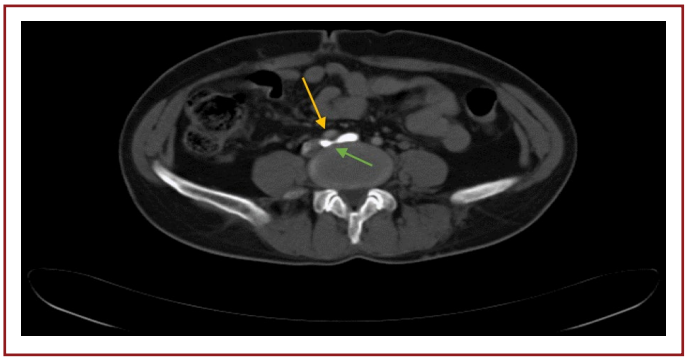

Figure 2. MDCT Venography axial section showing compression of the right common iliac artery on the left common iliac vein as in May-Thurner Syndrome (yellow arrow: left common iliac artery, green arrow: left common iliac vein).

Figure 3. Left iliac vein compression on contrast venography (white arrow).

Figure 4. Control contrast venography after endovascular treatment showed that the pressure on the left common iliac vein had disappeared (black arrow).

Figure 5. Control MDCT Venography coronal section after endovascular treatment showing the patent stent in the left common iliac vein (gray arrow).

1 cc heparin at the outset of each procedure. Systemic heparinization was sustained for three days post-procedure to maintain the activated partial thromboplastin time (aPTT) within the targeted range of 60-90 seconds, and oral anticoagulants were prescribed for six months to maintain the international normalized ratio (INR) between 2.0 and 3.0. During the follow-up after endovascular treatment, symptom regression was observed in all cases. Control imaging, conducted via MDCT Venography on average within the first six months, revealed patent stents with no apparent signs of restenosis (Fig. 5).

Discussion

The first comprehensive anatomical investigation of May-Thurner Syndrome was conducted by May and Thurner in 1957, involving 430 cadavers, revealing that compression of the left common iliac vein between the right common iliac artery and the lumbar vertebrae occurred in 22% of cases[2]. The resultant morphological alteration in the venous structure, termed 'spur formation,' involves banding of the vein lumen due to intimal hypertrophy, along with changes in elastin and collagen content of the iliac vein wall resulting from mechanical compression by the main iliac artery and the traumatic effects of chronic arterial pulsation, thus posing a risk factor for thrombosis in the iliofemoral vein wall. Subsequently, similar findings reported by Cockett et al.[3,4] led to the naming of iliac vein compression syndrome as Cockett Syndrome in Europe and May-Thurner Syndrome in the USA.

Patients presenting with clinical symptoms and signs undergo definitive diagnosis through radiologic imaging methods such as Color Doppler Ultrasonography (CDUS), Multidetector Computed Tomography (MDCT) Venography, Magnetic Resonance (MR) Venography, and conventional venography. CDUS stands as the initial and preferred diagnostic approach due to its noninvasive nature, minimal risk to patients, ease of use, accessibility, and capacity to determine the localization, severity, and stage (acute, subacute, chronic) of venous insufficiency or deep vein thrombosis (DVT). However, specific May-Thurner Syndrome indicators such as iliac vein compression and intraluminal spur formation may not always be visualized by CDUS. Factors such as patient-related obesity, intra-abdominal gas superposition, and inadequate breathing coordination, coupled with user and device limitations, hinder comprehensive examination of iliac arteries and veins with CDUS. Barutca et al.[5] conducted a study involving 30 patients with clinically suspected DVT in the inferior vena cava and iliac veins, utilizing CDUS followed by MDCT Venography within 24 hours. The study concluded that MDCT venography exhibited greater reliability than CDUS in diagnosing DVTs affecting the iliac and inferior vena cava, albeit with potential for false positive results in veins beyond the occluded segment in MDCT venography. Consequently, CDUS alone proves insufficient for definitively diagnosing May-Thurner Syndrome, necessitating additional modalities in cases of uncertainty.

When suspecting structural variations like May-Thurner Syndrome, MDCT Venography emerges as the predominant diagnostic modality, playing a crucial role in diagnosis. MR Venography may be preferable in instances where the use of iodinated contrast media is contraindicated, such as in cases of kidney insufficiency, contrast media allergy, and pregnancy. Numerous studies have underscored the high sensitivity and specificity of MDCT venography in diagnosing May-Thurner Syndrome[6-7]. Notably, this method's advantages include its ability to visualize extra-pudendal and retroperitoneal venous collaterals in the pelvic region[8]. Moreover, it aids in excluding pathologies like metastatic LAP compression, hematomas, and treatment-resistant cellulitis, which manifest similar clinical findings to May-Thurner Syndrome.

Kibbe et al.[9] conducted a retrospective investigation into iliac vein compression among asymptomatic patients. In a series of 50 consecutive patients presenting to the emergency department with abdominal pain and undergoing whole abdomen CT examination with IV contrast, iliac vein compression was graded in three categories: >25%, >50%, and >75%. Results revealed that 24% of cases exhibited over 50% compression, while 66% displayed over 25% compression. Conversely, no significant compression was noted in the remaining cases. Notably, no significant correlation was observed between patient age, common iliac artery diameter, and the degree of compression. Interestingly, it was found that iliac vein compression is more prevalent in women than men. Consequently, it was concluded that iliac vein compression is not uncommon in asymptomatic cases. In our study, among 20 patients diagnosed with May-Thurner Syndrome, 2 asymptomatic patients were incidentally discovered (10%).

Contrast venography stands as the most definitive diagnostic modality, capable of visualizing iliac vein stenosis, with the potential for performing endovascular treatment in the same session if necessary. Treatment approaches vary based on patient symptoms and the severity of compression. In cases of significant compression, options include stent-balloon dilatation or surgical intervention, while varicose vein treatment for venous insufficiency and thrombolytic treatment for thrombus may be applied in other cases. Radiologic criteria for endovascular treatment entail more than 50% luminal narrowing of the iliac vein and loss of contrast density. Technical success is defined as less than 30% restenosis. To mitigate the risk of stent restenosis, patients should undergo anticoagulant therapy post-procedure. While stent fracture, hemorrhage around the stented vessel, and stent narrowing are less common, re-intervention may be necessary if stent narrowing is detected, typically through balloon dilatation. Follow-up involves clinical assessment and imaging methods[10].

Numerous single-case reports in the literature document May-Thurner Syndrome with endovascular treatment[11-16]. Jeon et al.[17] presented 30 cases of May-Thurner Syndrome with iliofemoral vein thrombosis and stent treatment. Morphologic changes in the left main iliac vein, classified into three types based on MDCT venography findings, include: Type 1 (focal compression), Type 2 (diffuse atrophy), and Type 3 (diffuse chordization). This classification aids in assessing thrombosis risk and guiding endovascular treatment planning. In our study, 9 cases were Type 1, 9 were Type 2, and 2 were Type 3. Notably, one Type 2 case initially classified as Type 1 showed progression to Type 2 over three years, demonstrating the morphological changes associated with chronic compression in May-Thurner Syndrome.

Heijmen et al.[18] treated six patients with May-Thurner Syndrome using self-expanding stents and percutaneous transluminal angioplasty (PTA). Follow-up imaging after approximately one year revealed stent patency in five of six cases, with stent occlusion noted in one case. Endovascular treatment was performed in four of our 20 patients, with MDCT venography conducted for control

evaluations within the first six months on average. All cases demonstrated patent stents with no evidence of restenosis. Case studies in the literature also document early-age diagnoses and endovascular treatment. Raffini et al.[19] administered thrombolytic therapy followed by successful PTA-stent treatment in three adolescent patients with May-Thurner Syndrome and iliac vein thrombosis. Oguzkurt et al.[20] visualized iliac vein compression in a 10-year-old male patient with left lower extremity edema and performed successful PTA-stent treatment.

Conclusion

It's crucial to consider May-Thurner Syndrome in the differential diagnosis of female patients exhibiting signs of venous insufficiency and/or recurrent deep vein thrombosis (DVT) in the left lower extremity, particularly in the 2nd to 4th decades, to ensure timely and appropriate treatment and prevent potential complications. Radiological methods such as Multidetector Computed Tomography (MDCT) venography and conventional venography confirm the diagnosis in suspected cases, leading to successful outcomes with effective endovascular treatment.

Ethics Committee Approval: This study was conducted in accordance with the Declaration of Helsinki and approved by the University of Health Dr. Siyami Ersek Thoracic and Cardiovascular Surgery Training and Research Hospital Ethics Committee with the decision no. E-28001928-604.01.01 of June 21, 2022.

Peer-review: Externally peer-reviewed.

Authorship Contributions: Concept: D.D., S.B.S., H.B., H.S., S.S.; Design: D.D., S.B.S., H.B., H.S., S.S.; Supervision: D.D., S.B.S., H.B., H.S., S.S.; Fundings: D.D., S.S.S.; Materials: D.D., S.B.S.; Data Collection or Processing: D.D., S.B.S.; Analysis or Interpretation: D.D., S.S.; Literature Search: D.D., S.B.S., H.B., H.S., S.S; Writing: D.D.; Critical Review: S.S.

Use of AI for Writing Assistance: Not declared.

Conflict of Interest: None declared.

Financial Disclosure: The authors declared that this study received no financial support.

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