The term ‘Vascular Anomalies’ encompass both hemangiomas and vascular malformations such as Klippel-Trenaunay-Weber, Proteus and Maffucci syndromes (1). They are congenital abnormalities and malformations inherent to the endovascular intima resulting in tortuous or insufficient anastomoses or benign neoplasms.

Rare congenital anatomical malformations have also been proposed under the umbrella of anomalous vasculature (2) such as deep vein abnormalities and miscellaneous venous variants (e.g. absence of inferior vena cava). Overlooked syndromes include anatomical vascular anomalies in which the intrinsic anatomy of vessels limits their own function, for example iliac vein compression syndromes (IVCS) such as May-Thurner Syndrome (MTS). Data from the Framingham study indicates that lower extremity venous abnormalities are present in up to 27% of the American adult population (3), having a significant impact on quality of life despite being often overlooked.

This article will take a broader look at May-Thurner Syndrome and discuss controversies regarding its diagnosis and treatment, whilst highlighting broader dilemmas regarding vascular anomalies in general.

**MAY-THURNER SYNDROME**

In 1851 Virchow first described a left-sided predominance of iliofemoral DVT secondary to venous stasis. He hypothesized that the iliac vein was compressed between the right common femoral artery onto the lumbar spine, resulting in chronic external irritation forming a lesion within the vessel. Obstruction of the left common iliac vein due to intraluminal adhesions was affirmed in 28% of 56 autopsies conducted by McMurrich in 1908 (3). This phenomenon was further studied by Enrick and Krumbhaar in 1943 who found obstruction in the left iliac vein in 23.8% of cases at the point where the right common iliac artery anteriorly crossed the left common iliac vein. Continued research by May and Thurner in 1956 gave descriptions of “spur like” formations of the left common iliac vein in 22% of the autopsies of 430 cases, giving their names to this syndrome. These spurs composed of fibrocytes, collagen, and numerous capillaries separate from elastic fibres in the wall of the vein. They described 3 morphological presentations: (4)

1) lateral spurs where the lesion protrudes from the medial and lateral vein walls
2) central spurs where the lumen is completely divided dorso-anteriorly
3) partial obliteration in which the lumen is almost entirely obliterated by a fenestrated diaphragm.

**PATHOLOGY**

They deduced that these spurs were formed from chronic pulsatile vibratory irritation of the systemic system on the iliac vein’s venous endothelium between the overlying right common iliac artery and the lumbar vertebral body. This mechanical stress induces local intimal proliferation and hypertrophy within the vein resulting in spurs leading to symptomatic venous obstruction of the left lower extremity and impaired venous return (4).

Virchow’s triad describes increased risk of venous thrombosis with 1) stasis, 2) hyper-coagulability and 3) vessel intimal injury. IVCS compression meets two such criteria, that of altered stasis and frictional damage of venous
wall, resulting in an increased risk of Deep Vein thrombosis (DVT). (5;6), (4), (7))

**EPIDEMIOLOGY**

Left iliac vein compression is estimated to be present in 2% to 5% of patients undergoing evaluation for venous disorders of the lower extremity(8). Approximately 50%-60% of patients presenting with left-sided iliofemoral DVT have common iliac vein intraluminal webs or spurs from extrinsic compression of the left iliac vein at the crossing point of the right common iliac artery (5). The condition is more common in women than men (70% vs 30%) and tends to present in patients ranging from 23 to 45.5 years of age (4).

**Variants:**

Vascular anomalies with an anatomical cause however do not have homogeneous presentations. Classic May–Thurner syndrome describes compression of the left common iliac vein by the right common iliac artery. Variants include:
- Compression of the LCIV by the left internal iliac artery or a tortuous left common iliac artery.
- Compression of the right common iliac vein by the right internal iliac artery or the right common iliac artery (right-sided).
- Compression of the inferior vena cava by the right common iliac artery (9).

**Signs:**

Under normal circumstances, there should be no significant pressure differences between the lower IVC and the external iliac veins unless haemodynamically significant obstruction is present (10). A difference of greater than 1.4 mm Hg with exercise is considered abnormal. Marked formation of collateral flow further indicates that a blockage is present (7) (6) (8).

**Diagnosis:**

When a patient presents with symptoms or signs of venous thrombosis the Wells score for DVT pre-test probability can be used for assessing the risk of DVT. Patients who have a high score (2 or higher) are investigated with a duplex ultrasonography. Patients with low Wells score (less than 2) are investigated by measurement of serum D-dimer levels, which if positive necessitates a duplex scanning to be performed. If there is a low score and a negative D-dimer test, a DVT is excluded and the patient is ‘out of guidelines’ for further investigation (11).

**CLINICAL DILEMMAS IN VASCULAR ANOMALIES**

1: Iliac Vein Compression Syndromes (IVCS) may remain undiagnosed as patients can present with either a DVT or Chronic venous insufficiency (3). According to this algorithm no further investigation is advised for symptomatic patients without DVT and a negative D-dimer test, thus possible May-Thurner patients may go undiagnosed, which can lead to deterioration of the condition leading to future DVTs. Angiography should therefore be considered in patients with low risk of DVTs that present with recurrent left lower limb thrombosis.

2: Ultrasound alone in the absence of endovenous imaging of patients cannot diagnose iliac vein compression. Ultrasound is quick, simple and the imaging of choice for this algorithm. It can be a reliable identification tool for patients with ilio-femoral venous occlusion,
however, it is less reliable in iliac vein stenosis (12). Other problems with ultrasound include difficulties of direct visualization of the iliac veins in the pelvis due to overlying pelvic organs and bowel gas, as well as misleading results due to large collaterals around the obstruction site resulting in normal Doppler waveforms in the area (12). Although adequate for DVT assessment and subsequent treatment, anatomical abnormalities may not be adequately measured by ultrasound alone.

3: Which patients should receive further investigation? Currently there are no guidelines regarding continued investigation of a patient beyond ultrasound assessment (regardless of DVT status). However increasing evidence suggests that in a symptomatic setting of unilateral leg oedema and pain, with a negative ultrasound scan further investigations of the pelvic veins should be considered (12). Other more powerful imaging techniques which have shown good diagnostic qualities in the setting of May-Thurner include venography, computer tomography angiography, air plethysmography and direct pressure gradient measurements.

Ascending venography is the gold standard diagnostic test for DVT however this invasive technique is expensive and a poor choice for serial monitoring (13). It is therefore rarely used for screening purposes. However, it is capable of highlighting haemodynamically significant iliac vein compression and is an excellent diagnostic tool for compression syndromes. Improved rates of diagnosis and subsequent treatment of iliac vein compression syndromes have reduced the rate of recurrent thromboses (14). Although venography is invasive and increases in-hospital costs it must be balanced against the economic burden of the post-thrombotic syndrome and consequences of iliac vein compression in terms of medical treatment, reduced patient quality of life (QOL) and financial productivity due to disability (14).

4: Management of thrombosis

The risk of consequent venous thromboembolisms, pulmonary embolisms and post-thrombotic limb syndrome (as well as loss of patient quality of life) mandate that treatment options focus on DVT prevention and symptomatic relief.

- **Treatment paradigms for all iliac compression syndromes involve:**
  1. Treating any current DVTs
  2. Preventing recurrent DVTs by anticoagulation (heparin followed by warfarin), compression bandaging and direct malformation correction.

- **The clot lysis can be achieved using catheter directed thrombolysis (CDT).** Although indications for CDT are not well established, current consensus suggest that young patients who are at higher risk of developing post-phlebitic limb syndrome or those with limb-threatening thrombosis may be candidates for CDT (14) (5).

5: Re-thrombosis risk in May-Thurner patients

Clot lysis doesn’t address the mechanical source of obstruction. Kim et al 2006 states that “of the patients with DVT who had underlying venous spurs the patients who did not have specific treatment for it suffered a rethrombosis rate of 73% despite anticoagulation” (6). Due to chronic physical compression by the right common iliac artery and the large size of the thrombus that develops at the iliac vein, anticoagulation alone is usually ineffective in treating the DVT (6). This highlights the importance of treating the underlying mechanical cause of the venous thrombosis. In 1965 Cocket and Thomas described autologous saphenous vein bypass with limited success. Other surgical treatments have included dissection of the right common iliac artery and placement into a peritoneal sling, re-implantation of the left common iliac vein onto the vena cava, and venotomy with excision of intraluminal adhesions which provided significant symptomatic relief to patients, with patency rates of up to 88% (8). Although results with surgical repair are good, these procedures necessitate performing a midline laparotomy or retroperitoneal iliac exposure which incur additional risks (8).

Recently, following catheter-directed thrombolysis, **endovascular venous angioplasty with**
has been used to treat DVT in these patients (6). Percutaneously placed metallic stents for the management of this problem have been shown to be successful and stent placement has been advocated as the treatment of choice. Of those who had specific treatment by stenting only 13% had rethrombosis (6). The role of venous stenting in general remains controversial nevertheless.

6: Stenting is not commonly used for prevention of DVTs. The rationale for angioplasty with stent insertion in venous stenosis is that stenting is effective and safe in venous obstruction and restores venous patency. Studies also suggest CDT is complemented by venous stents should thrombolysis alone fail or an anatomical abnormality be identified (14) (12).

Stenting has excellent immediate results and early venographic patency rate with few complications following localised catheter-guided thrombolysis and angioplasty with stent insertion (6). This procedure improves pain and oedema in most patients with iliofemoral venous obstruction (12) and has over 90% 1 year survival (15). To minimize residual clot propagation and pulmonary embolism, all the patients should receive standard prophylactic treatment with anticoagulants for 6 months (6). Despite the lack of large-scale prospective studies, treatment of the May–Thurner syndrome with venous stents can be concluded to be safe and effective, based on intermediate data. Since May–Thurner patients are often young, conclusions regarding the long-term behaviour of these stents are as yet undefined. Long-term follow-up is necessary to assess the long-term patency and risk of stenosis of the venous stents (8). However endovascular treatment is the method of choice for managing occlusive lesions of the iliofemoral venous system (12). This anatomical anomaly appears to be highly amenable to correction by endovascular surgical techniques (10). The American College of Chest Physicians guidelines now support correction of underlying venous lesions using balloon angioplasty and stents in patients with acute DVT (16).

Conclusions: The cost of treating venous disease is calculated to be close to $1 billion annually as well as costing $2 million in lost workdays. It is ranked second only to upper respiratory tract infections as a cause of lost days at work (3). May-Thurner Syndrome is an uncommon cause of DVT which should be considered in patients with major thrombosis of the left iliac vessels (17). Identifying and treating the underlying pathology can increase patient quality of life and reduce long term disability resulting from post thrombotic syndromes. In the case of May–Thurner Syndrome the main challenge is the diagnosis of a condition that has a common presentation but an uncommon aetiology. As is the case with many uncommon vascular anomalies, awareness of their existence is essential in their timely diagnosis, as well as willingness to explore less common therapeutic modalities, such as venous stenting and clot lysis.

Reference List


