

Iliac vein compression syndrome: literature review

Síndrome de compressão da veia íliaca: revisão de literatura

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Abstract

Iliac vein compression syndrome is a clinical condition in which the right common iliac artery extrinsically compresses the left common iliac vein. The syndrome predominantly affects young women between their 2nd and 4th decades of life. In view of the syndrome's potential complications, it should be recognized/diagnosed and treated in symptomatic patients before it causes irreversible damage to patients' venous systems. Noninvasive methods, such as venous color Doppler US are reasonable screening methods, but angiotomography and magnetic resonance angiography are more reliable diagnostic tools and the method of choice for confirmation of diagnosis remains multi-plane phlebography with measurement of pressure gradients. Endovascular treatment (angioplasty with placement of self-expanding stents) is safe and effective and can replace open surgical reconstruction and/or anticoagulation alone.

Keywords: May-Thurner Syndrome; iliac artery; iliac vein; venous insufficiency; phlebography; angioplasty.

Resumo

A Síndrome de Compressão da Veia Íliaca (SCVI) é uma situação clínica na qual a artéria íliaca comum direita comprime extrinsecamente a veia íliaca comum esquerda. Há uma predominância em mulheres jovens, entre a segunda e a quarta décadas de vida. Levando-se em consideração as complicações potenciais da síndrome, esta deve ser reconhecida/diagnosticada e tratada, em pacientes sintomáticos, antes que cause alterações irreversíveis no sistema venoso do paciente. Métodos não invasivos, como o US-Doppler colorido, quando realizados por examinadores experientes, são métodos de triagem razoáveis; porém, a angiotomografia e a angiorressonância são mais fidedignas. O método de escolha para a confirmação diagnóstica consiste na flebografia, em múltiplas incidências, com aferição de gradientes pressóricos. O tratamento endovascular (angioplastia com colocação de *stent* autoexpansível) é seguro e efetivo, podendo substituir a reconstrução cirúrgica aberta e/ou a anticoagulação isolada.

Palavras-chave: Síndrome de May-Thurner; artéria íliaca; veia íliaca; insuficiência venosa; flebografia; angioplastia.

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■ INTRODUCTION

Iliac vein compression syndrome (IVCS) is a clinical condition in which the right common iliac artery causes extrinsic compression of the left common iliac vein and which presents clinically as pain and edema in the left lower limb or even as left iliofemoral venous thrombosis.¹

Cockett & Thomas^{2,3} point out that this disease is one example of how a minor anatomic anomaly can be the underlying cause of an extremely significant pathological injury. Extrinsic compression of the left common iliac vein at this level has been given a variety of names, including May-Thurner syndrome, iliac venous compression syndrome, ilio caval compression syndrome and Cockett's syndrome.^{4,5}

This extrinsic compression is not infrequently the cause of venous abnormalities in the left lower limb, which are very often considered as 'primary' conditions because of the failure to diagnose the compressive disease.⁶ The true prevalence of this condition is unknown because, as phlebography has been substituted by noninvasive methods (primarily Color Doppler US) for diagnosis of venous diseases of the lower limbs, many cases of chronic venous insufficiency and/or left iliofemoral venous thrombosis that are linked with IVCS have not been diagnosed etiologically.⁷

When the right common iliac artery crosses over the left common iliac vein it appears to induce partial obstruction of the vein in two different ways: 1) simple mechanical obstruction, caused by compression of the vein between the artery and the vertebral body; and 2) extensive intimal hypertrophy of the vein can result from repeated compressions caused by the overlying arterial pulse, causing a certain degree of shear stress between the anterior and posterior walls of the vein.^{6,8-10}

Since IVCS is an under-diagnosed entity and one that causes venous abnormalities of the left lower limb with greater frequency than is generally thought, the objective of this article is to review the most important points related to the condition, from epidemiology to the treatment options currently available.

A bibliographic review of Brazilian and International studies was conducted after running searches on the MEDLINE (PUBMED), SCIELO and BIREME databases. The search strategy employed for MEDLINE was as follows: ("may-thurner syndrome"[MeSH Terms] OR ("may-thurner"[All Fields] AND "syndrome"[All Fields]) OR "may-thurner syndrome"[All Fields] OR

("thurner"[All Fields] AND "syndrome"[All Fields]) OR "may thurner syndrome"[All Fields]) OR ("may-thurner syndrome"[MeSH Terms] OR ("may-thurner"[All Fields] AND "syndrome"[All Fields]) OR "may-thurner syndrome"[All Fields]) OR ("iliocaval"[All Fields] AND "compression"[All Fields] AND "syndrome"[All Fields]) OR "iliocaval compression syndrome"[All Fields]) OR ("may-thurner syndrome"[MeSH Terms] OR ("may-thurner"[All Fields] AND "syndrome"[All Fields]) OR "may-thurner syndrome"[All Fields] OR ("cockett"[All Fields] AND "syndrome"[All Fields]) OR "cockett syndrome"[All Fields]). Studies were selected for review on the basis of reading their abstracts, characterizing this study as a narrative review.

■ EPIDEMIOLOGY

Although the true prevalence of IVCS is unknown, it is estimated that this condition is present in 2 to 5% of patients who have venous disease of the lower limbs.^{7,10} The reason why there is an imbalance in the normal anatomic relationship between artery and vein, interfering with venous flow, is also unknown.⁴

When the incidence of IVCS in patients with deep vein thrombosis of the left leg has been investigated, the rates observed have varied from 18 to 49%.¹¹ Many studies have reported evidence that left lower limb deep vein thrombosis prevalence rates are 3 to 8 times greater than the prevalence rates for the right limb,^{2,12} and IVCS is one possible explanation for this higher prevalence.

In 1943, Ehrlich & Krumbhaar¹³ conducted anatomic dissection of 412 cadavers, finding lesions obstructing the left common iliac vein in 23.8% of them. From a histological perspective, these lesions were not recanalized thrombosis, rather they were made up of elastin and collagen, without cellular inflammatory infiltrate or fibrosis. They also observed that 33.8% of these lesions occurred after 10 years of age, concluding that they were acquired (and not congenital).

This syndrome predominately affects females and, in 1965, Cockett & Thomas² described it as predominantly affecting young women in their second to fourth decades of life. In Brazil, Marques et al.⁸ studied 20 patients with the syndrome, finding that 80% of them were female and reporting a mean age of 34.4 years. Surgery, pregnancy and prolonged rest have been described as acute trigger factors.¹⁴

Based on autopsy findings, May & Thurner¹ reported a 22% prevalence of venous intraluminal

“spurs” at the level at which the right common iliac artery crosses the left common iliac vein anteriorly. Since iliac vein thrombosis is more common on the left side, it is believed that the compression and the “spurs” described by May & Thurner are responsible for many of these cases.

■ DIAGNOSIS

Clinical status

Iliac vein compression syndrome generally manifests as progressive edema of the left lower limb in individuals who do not apparently have risk factors for deep vein thrombosis and, in some cases, even when patients are on anticoagulation.¹⁴

Symptoms can vary from significant venous claudication to vague and mild complaints that are often attributed to primary chronic venous insufficiency. Physical examination may find edema, although generally moderate, and, more rarely, cutaneous abnormalities compatible with chronic venous insufficiency (varicose veins/lipodermatosclerosis/venous ulcers).^{9,10,15,16}

A literature review conducted by Moudgill et al.¹⁷ in 2009 confirmed that the disease predominantly affects female patients. By the time they are diagnosed, the majority of patients present with acute deep vein thrombosis in the left lower limb¹⁴ and a small proportion will present with edema or non-specific pain in the left lower limb, with no documented venous thrombosis.

Sandri¹⁶ and Boyd¹⁸ also reported that patients with signs/symptoms of left iliofemoral venous thrombosis caused by extrinsic venous compression tend to be young women, in their second to fourth decades of life, after prolonged immobilization or pregnancy. Clinical features includes persistent rhizomelic edema of the left lower limb, with or without other signs of venous hypertension.

Therefore, IVCS should be suspected when patient history and physical examination, supplemented by venous Color Doppler US, are incompatible with deep vein thrombosis in a young woman with edema of the left lower limb.⁹

Imaging

Patients with unilateral left-side edema are generally sent for venous Color Doppler US of the left lower limb, to rule out deep vein thrombosis, and abdominal computed tomography, to rule out a pelvic mass as cause of compression.¹⁹

Ultrasonography is subject to significant limitations for identification of IVCS, since it is

technically difficult to view the pelvic veins because of their deep location “hidden” behind the bladder, the intestines and adipose tissues.⁹ It has been observed that even experienced ultrasound specialists find it difficult to see the iliac veins in up to 20% of scans.²⁰

In response to the difficulty of directly viewing the compression, Barros & Coelho²¹ have described some indirect signs that can be seen on Doppler ultrasonography and can help to diagnose this clinical condition: 1) flow volume in the right common iliac vein 40% greater than the flow volume in the left common iliac vein; 2) ratio of peak velocity in the left common femoral vein to peak velocity in the right less than 0.9.

Under normal circumstances, there should be essentially no difference between pressures in the inferior vena cava and in the iliac veins, unless there is a stenosis with hemodynamic significance. A pressure gradient of 2 mmHg or more (measured using an intraluminal catheter during phlebographic examination) is a significant finding and, in combination with the presence of pelvic collateral circulation (Figure 1), has been used to confirm IVCS diagnoses.^{11,20}

Wolpert et al.¹⁹ analyzed a small group of 24 patients with magnetic resonance angiography and phlebography, achieving a good diagnostic correlation between the two, and emphasized the reduced invasivity of the first imaging exam and its ability to enable assessment of other pelvic structures.

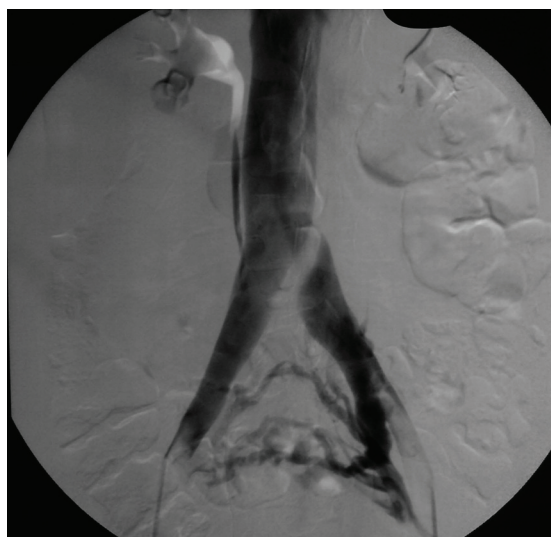


Figure 1. Classic phlebographic findings of IVCS: impression of the right common iliac artery crossing the left common iliac vein (a subtraction image), discrete venous dilation and pelvic collateral circulation.

The diagnostic method of choice for confirmation of IVCS has traditionally been phlebography,^{9,11,14,22} but Raju & Neglen²³ compared phlebography with intravascular ultrasonography (IVUS) and reported that phlebography was less sensitive than IVUS, finding that the two examinations offered, respectively, 66% and 90% capacity to detect this clinical condition.

Additionally, both extension and severity of the obstructive venous injury appear worse when seen on IVUS than according to phlebography findings, and Neglén and Raju²⁴ have shown that even severe obstructions can be underdiagnosed using phlebography. These authors investigated 304 limbs using phlebography with venous pressure measurement and IVUS and concluded that IVUS appears to be superior to single-plane phlebography for morphological diagnosis of stenotic lesions of the iliac veins. They also claim that further studies should be conducted to investigate the hemodynamic significance of lesions detected by IVUS in order to determine whether the results can aid in the decision of whether or not to intervene. Despite its apparent superiority, IVUS is still an expensive technique and many authors do not have this technology available or only employ it in selected cases.¹⁶

In view of the potential complications of IVCS (deep vein thrombosis and chronic venous insufficiency), this syndrome must be recognized/diagnosed in patients who exhibit symptoms related to it, to provide the opportunity for treatment before irreversible damage to the venous system occurs.^{11,25}

■ TREATMENT

There is no consensus in the literature with respect to treatment of patients with IVCS who have not yet developed deep vein thrombosis. However, since stasis is one of the three pillars of Virchow's triad, these patients probably have a greater chance of developing venous thromboembolism.¹⁸ On the other hand, there is a certain degree of consensus in the literature^{10,11,26} that symptomatic IVCS should always be treated.

Treatment options to improve symptoms and prevent thromboembolic phenomena consist of techniques to relieve the compression with either open surgery or with endovascular techniques, with the objective of alleviating the venous stasis in the left lower limb. If an invasive procedure is not chosen, a small number of authors advocate anticoagulation alone.

Since IVCS is a progressive disease, capable of causing incapacitating complications over the long term, an aggressive approach to achieving decompression should be strongly considered.^{4,11} Historically, several different surgical techniques have been employed to relieve symptoms and correct the resulting venous obstruction, the majority involving bypasses constructed with autologous veins,^{16,27} retropositioning of the iliac artery²⁸ and excision of the venous intraluminal spurs with subsequent venous patch angioplasty,^{7,11} among other techniques.

More recently, endovascular techniques have been employed both to treat iliofemoral venous thrombosis and to repair the anatomic abnormality underlying IVCS.^{10,11} The first report of exclusively endovascular treatment of IVCS was published by Michel et al.²⁹ in 1994. They treated the syndrome with percutaneous transluminal angioplasty and stent placement.

Cunha Jr et al.³⁰ described a case of an 18-year-old female patient who was successfully treated endovascularly by placement of a self-expanding elgiloy stent in the left common iliac vein to counteract the extrinsic venous compression caused by pulsation of the overlying right common iliac artery. An intraluminal stent was also implanted successfully by Foit et al.¹⁴ (in a case with concomitant thrombolysis) in a male patient who was diagnosed with IVCS 4 days after surgery for a tibial plateau fracture.

Sandri³¹ studied a series of 54 patients with IVCS treated with endovascular techniques, observing total or near total resolution of symptomology in 52 of them (92.5%), conferring a considerable improvement in quality of life.

Moudgill et al.¹⁷ analyzed data from 113 patients (72% women), the majority treated with catheter-guided thrombolysis followed by intravascular stent placement, observing a 95% mean technical success rate and a 96% mean 1-year patency rate. O'Sullivan et al.²⁰ also reported that endovascular treatment of IVCS is safe and effective and can substitute surgical reconstruction and/or anticoagulation alone. However, in view of the fact that these patients are mostly females and are generally of reproductive age, more studies are needed to assess the long-term patency of these stents.

More recent treatments, such as percutaneous transluminal angioplasty with self-expanding stent placement, have been linked with improved treatment success¹³ because, in addition to treating the intraluminal trabeculae and "spurs", they also

enable alleviation of the extrinsic mechanical compression.^{9,11,32}

Reports such as those described above and also retrospective and prospective studies of case series have shown that endovascular treatment is now the first-line approach.^{9,11} The majority of authors^{11,17} recommend a minimum of 6 month anticoagulation after stent placement in the venous system, unless there is a specific contraindication to doing so.

Migration of stents placed in the iliofemoral venous axis is a rare, but devastating, complication that has been described in the literature.³³ If this type of embolization occurs, removal can be accomplished either percutaneously or by open surgery, depending on the site.

Conservative treatment simply involves pain control, with or without drug prophylaxis for deep vein thrombosis. Since there are no reports of spontaneous resolution of IVCS to date, the decision to limit intervention to conservative treatment can be a difficult one to take for a patient (generally young and active), who suffers from discomfort in the left lower limb at rest or during physical exercise.¹⁸ Anticoagulation alone has not proven effective to control symptoms in symptomatic patients.¹⁴

Due to the rarity of this diagnosis, there are no randomized studies or large follow-up studies comparing open/endovascular/clinical treatments and, therefore, even though the endovascular approach is becoming more and more widely accepted, there is no consensus in the literature with regard to the most appropriate treatment for this disease.¹⁸ Raju³⁴ reviewed the contemporary literature, analyzing studies that described treatment of a total of approximately 1,500 patients and concluded that endovascular treatment for IVCS is a safe and effective alternative, compared with traditional open surgery treatment.

■ FINAL COMMENTS

Before patients are labeled as suffering from primary venous valve insufficiency, it is important to remember that persistent edema of the left lower limb or even just 'sensation of heaviness' in the left lower limb (particularly in young patients) may be the result of IVCS.^{9,10,11}

The true prevalence of this disease is very likely to be higher than that described in the literature, because in many patients with left iliofemoral venous thrombosis this syndrome may be a hidden etiologic agent that is often neglected during work-up.³¹

Noninvasive methods (Color Doppler-US) are reasonable options for screening, if used with the objective of detecting this disease and performed by experienced examiners. However, angiogramography and magnetic resonance angiography are the most reliable imaging tests and remain the methods of choice for diagnostic confirmation, particularly here in Brazil where IVUS is not widely available yet, while the gold standard imaging method remains multi-plane phlebography with measurement of pressure gradients.

The endovascular approach is currently in the process of becoming the first line treatment, but treatment must still be tailored to patients, choosing the best option for their individual characteristics and clinical status.

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