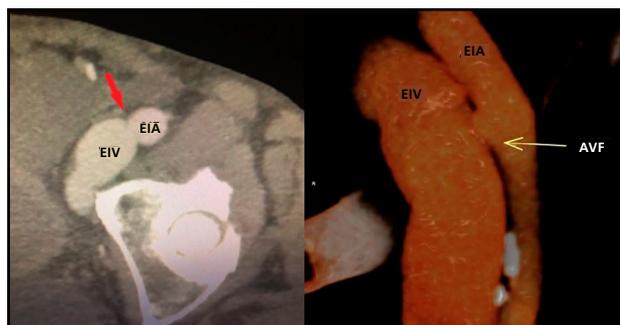


## Heart Failure Due to External Iliac Arteriovenous Fistula After Laser Ablation of the Saphenous Vein

Chronic venous failure caused by varicose veins is a common medical condition in adults. A meta-analysis demonstrated that endovenous laser ablation was more effective in reducing the rate of complications compared with conventional surgery. (1) However, complications are different, including nerve injury, thrombophlebitis, superficial burns, and arteriovenous fistulas (AVF).

A 78-year-old male patient with a history of hypertension and endovenous laser ablation (1,470 nm diode) of the left internal saphenous vein due to severe venous failure 8 years ago, was admitted to the emergency room for functional class (FC) IV dyspnea, with anasarca and edema of both lower limbs, and a diagnosis of heart failure. During questioning, the patient referred two hospitalizations due to the same clinical presentation in the last 6 months in another medical center, with a positive response to the medical treatment.

Physical examination revealed systo-diastolic murmur with thrill in the left inguinal region. The Echo-Doppler reported an external iliac arteriovenous fistula with 6 mm neck diameter, high-velocity and low-resistance flow pattern, without associated venous thrombosis in the deep and superficial venous system. The echocardiogram showed a 57 mm left ventricular diastolic diameter, 64% EF and moderate diastolic dysfunction, enlarged right ventricle, TAPSE 17, dilated pulmonary artery trunk, dilated inferior vena cava of 33 mm diameter and 9% collapse, bilateral pleural effusion, and ascites. A CT angiography confirmed the fistula between the artery and the left external iliac vein adjacent and immediately proximal to the inguinal ligament, with a diameter of about 6.2 mm, determining proximal dilation of the ipsilateral common iliac vein (Figure 1). Since the patient was in anasarca, and considering the high risk and the vascular anatomy, endovascular treatment was decided, and a 16 mm - 10 mm × 7 cm endoluminal Excluder® iliac extension was implanted in the left external iliac artery under neuroleptanalgesia and by



**Fig. 1.** CT angiography: arteriovenous fistula (AVF) with dilation of external iliac (EI) vessels.



**Fig. 2.** A. Arteriography with arteriovenous fistula (AVF) in external iliac (EI) vessels. B. Complete AVF exclusion following covered stent implantation

superficial femoral access, achieving the complete exclusion of the A-V fistula between the artery and the left external iliac vein (Figure 2). The patient made good progress and was discharged under clopidogrel 75 mg, aspirin 100 mg, enalapril 5 mg, and bisoprolol 5 mg/d. During the first month, anticoagulation with 5 mg/d apixaban was indicated to prevent deep vein thrombosis due to the sudden decrease in the high venous flow of the pelvic and intra-abdominal collateral veins. At the 12-month follow-up, the patient was in FC I, and with absence of murmur and thrill in the left inguinal region.

Endovenous laser ablation is a percutaneous treatment under local tumescent anesthesia, in which distal saphenous vein cannulation is performed under ultrasound guidance, and a laser fiber is inserted. The laser energy heats the blood and vessel endothelium, causing thrombotic and fibrotic occlusion of the treated vein. Tumescent anesthesia not only makes the procedure tolerable for the patient, but also protects the structures adjacent to the saphenous vein, since it physically separates the tissues and also acts as a heat sink, avoiding thermal damage. Furthermore, this type of anesthesia compresses the vein, thus reducing its diameter and increasing the effectiveness of the treatment.

Arteriovenous fistula formation after endovenous thermal ablation is an extremely rare complication, and has been described in the early or late postoperative period, both in the treatment of internal or external saphenous vein. In patients undergoing endovenous thermal laser ablation, Theivacumar et al. (2) reported < 0.2% development of arteriovenous fistula, while Rudarakanchana et al. (3) reported this complication in 0.15% of cases in 2,500 procedures analyzed after venous thermal ablation in the same medical center, mainly after laser ablation (73%), and the rest with radiofrequency. Most authors describe small, asymptomatic arteriovenous fistulas, diagnosed as a control Echo-Doppler finding, which resolve spontaneously. (2, 3) Two possible mechanisms of arteriovenous fistula formation are considered during venous laser ablation: the concomitant venous and arterial

injury with the needle during administration of tumescent anesthesia, and the thermal energy transfer with the laser probe that could cause degradation and perforation of the vein wall with arterial injury.

Very few cases of arteriovenous fistula in the external iliac system are reported in the literature, probably caused by the inadvertent advancement of the probe through the saphenous vein arch in the external iliac vein either with mechanical perforation through the vein into the artery or vessel wall damage due to activation of the laser while still within the external iliac vein. Lack of tumescent anesthesia at this level likely increases the risk of damaging the arterial wall. (4-5) Echo-Doppler and CT angiography are the non-invasive imaging methods to confirm the diagnosis, and allow for the characterization of the arteriovenous fistula (location, size and flow); an additional angiography is only required if an intervention is considered for marked lower limb edema, recurrent varicose veins, venous complications (phlebitis, ulceration), intermittent lower limb claudication from steal syndrome or heart failure. (2) The cases of external iliac arteriovenous fistula –including our case– were reported in the post-treatment of the internal or great saphenous vein, and all of them presented systo-diastolic murmur with thrill in the homolateral inguinal region to treatment. Diastolic heart failure was the most common clinical presentation, together with dyspnea, ascites, edema and lower limb heaviness with unilateral predominance, and occurred between 3 weeks and 2 years after surgery. (4, 5) Cases of heart failure and superficial femoral artery arteriovenous fistula have also been described after laser ablation of the saphenous vein. (6) All patients required either conventional surgery or endovascular treatment with covered or hybrid stent, depending on the anatomical proximity of the arteriovenous fistula to the inguinal ligament and the size of the fistula. In every case, symptoms were resolved, with disappearance of the murmur and inguinal thrill. (4, 5)

In summary, arteriovenous fistula is a rare complication of endovenous laser treatment, but it can develop high flows and cause heart failure in some patients. Therefore, the presence of iatrogenic arteriovenous fistulas should be ruled out in patients with signs and symptoms of heart failure and a recent or long-term history of saphenous vein failure treatment with laser ablation.

#### Conflicts of interest

None declared.

(See authors' conflicts of interest forms on the website/ Supplementary material).

#### Ethical considerations

Not applicable

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#### Persistent ST-Segment Elevation Due to Myocardial Infiltration

In most cases, ST-segment elevation is due to acute coronary occlusion. However, atypical presentation or atypical evolution should make us consider other etiologies.

We present the case of a 71-year-old patient with persistent chest pain and shortness of breath. The electrocardiogram (ECG) showed ST-segment elevation in leads V2 through V4. A severe non-occlusive lesion was found in the distal left anterior descending artery and a stent was implanted, resulting in unsuccessful ST-segment normalization. Days later, symptoms recurred and a computed tomography (CT) scan revealed lung cancer with multiple metastases including the myocardium. ST-segment elevation in the ECG could indicate tumour invasion of the myocardium at the level of the left ventricle.

A 71-year-old man presented at the emergency department with persistent chest pain and shortness of breath. The ECG showed ST-segment elevation in leads V2 through V4 (Figure 1a). He had a history of arterial hypertension and smoking. He was referred to another hospital to undergo urgent revascularization. Coronary angiography showed critical narrowing at the distal segment of the left anterior descending artery (LAD), which was successfully treated with a drug-eluting stent (Figures 2a and 2b). Atypical evolution was observed, with persistent ST-segment elevation but without necrosis (no Q-waves [Figure 1b], no troponin el-