Chronic lower leg swelling caused by isolated popliteal venous entrapment

Aikaterini A. Angeli, MD, Dimitra A. Angeli, MD, Chryssanthi A. Aggeli, MD, and Dimitris P. Mandrekas, MD, PhD, Athens, Greece

Isolated popliteal vein entrapment is a rare pathologic condition. Mimicking any venous pathology, a high degree of suspicion is mandatory for diagnosis. We describe a case of a 50-year-old woman, suffering from excessive swelling and heaviness of her left leg for more than 15 years. The ascending venography at functional positions of the feet demonstrated the entrapment. A rich collateral venous network appeared in the popliteal area at plantar foot’s flexion. Surgical division of a wide soleus aponeurosis decompressed the vein. At the 2-year follow-up, the patient remains free of recurrence. (J Vasc Surg 2011;54:851-3.)

CASE REPORT

A 50-year-old woman presented, suffering from excessive nonpitting edema of her left calf for more than 15 years. She already had a bilateral saphenectomy that failed to treat the swelling. At presentation, the patient’s left calf was remarkably larger than the right one and slightly cyanotic. The patient described that her best physical condition was in the morning hours, while heaviness and pain ensued after physical activity. She worked as a receptionist and mentioned her preference for high heels.

At admission, colored duplex ultrasound demonstrated mild incompetence of the left small saphenous vein and of the deep venous system in the same degree bilaterally. Incompetent perforators of the left calf were also traced. Under suspicion of popliteal entrapment, the test was repeated at active plantar flexion of both feet against resistance, but the suspected syndrome was not confirmed.

For further investigation, a magnetic resonance venography (MRV) is the ideal diagnostic method. Unfortunately, the relative infrastructure was not available at that time in our institution. Then, we proceeded to ascending venography that showed normal popliteal venous patency in the neutral position of the feet (Fig 1). With the feet planetary flexed against resistance, the left popliteal vein became obliterated, while a rich collateral venous network appeared in the popliteal area (Fig 2). The right popliteal vein remained patent at any feet’s position. Passive plantar flexion was not tested. Arteriography showed no arterial involvement in the entrapment.

The patient was submitted to surgical exploration by an s-shaped popliteal incision. A wide tendinous band in continuity...
with soleus muscle, extending to intercondylar femoral area caused the phenomenon. The band was divided and the popliteal vein was freed from any fibrous attachment. The incompetent left small saphenous vein was also removed from the same incision. The patient was mobilized early, having an uneventful recovery. She was discharged with prescription of supportive stockings. No anticoagulants were administered. A small wound seroma totally resolved by the end of the month. Soon, the legs became symmetric. At the 2-year of follow-up, there was no sign of recurrence. The patient uses compression stockings and occasionally wears high-heeled shoes.

**DISCUSSION**

Because of the low incidence of isolated popliteal vein compartment syndrome, only a few studies are published. Two of these studies, support that functional compression of the popliteal vein is a common venographic or sonographic finding in the healthy population, with a questionable, though, clinical importance.

The clinical presentation of the syndrome mimics venous stasis: leg swelling, heaviness, varicosities, night cramps, and even venous thrombosis are common manifestations. Given the intermittent nature of the compartment mechanism, it is possible that the patient’s lifestyle intervened to prolong the swelling. Occupational factors, along with her preference for high-heeled shoes, may have reproduced the entrapment mechanism for many hours daily.

Contribution of the incompetent small saphenous vein and of the deep venous system to clinical presentation is also possible, but, still, alone cannot justify the unilateral, localized type of swelling. In three studies, clinical improvement is reported after small saphenous ligation and stripping in cases of suspected popliteal entrapment. In our case, the incompetent small saphenous vein was removed in an attempt to optimize the surgical outcome.

It is obvious that a strong clinical suspicion is crucial for diagnosis: severe symptoms not alleviated by the use of compression stockings, swelling below the knee, unexplainable recurrences after venous surgery, worsening of pain at walking where no arterial pathology is present, and even an unjustified popliteal vein thrombosis, all may prompt further investigation.

### Table: Overview of the studies reported on isolated popliteal vein entrapment syndrome

<table>
<thead>
<tr>
<th>Studies (Ref no.)</th>
<th>Number of limbs</th>
<th>Symptoms</th>
<th>Diagnostic method</th>
<th>Causative mechanism</th>
<th>Treatment</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ref (1)</td>
<td>200</td>
<td>Healthy</td>
<td>Duplex ultrasound, air plethysmography, Ambulatory venous pressure, air plethysmography, colored duplex, ascending venography</td>
<td>Unknown</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Ref (2)</td>
<td>30</td>
<td>Swelling 30%, pain 33%, stasis dermatitis 7%, stasis ulceration 30%</td>
<td>Medial gastrocnemius head 18, 3rd gastrocnemius head 1, lateral head origin 5, soleus sling 3, thick periveneous fascia 13, abnormal course of vascular bundle 2, unknown 1</td>
<td>Division of musculotendinous structures, small saphenous vein division</td>
<td>Pain submission 76%, swelling submission 63%, “excellent” 41%, “unchanged” 26%, “worse” 11%</td>
<td></td>
</tr>
<tr>
<td>Ref (3)</td>
<td>3</td>
<td>Vein thrombosis (1), venous stasis (2)</td>
<td>N/A (1) impedance plethysmography (2), ascending venography (2)</td>
<td>Fibrous extension of the medial head (2), abnormal origin of small saphenous (1)</td>
<td>Surgical division (2), conservative (1)</td>
<td>Symptoms improvement (3)</td>
</tr>
<tr>
<td>Ref (4)</td>
<td>1</td>
<td>Pain, drop foot</td>
<td>Electrophysiology test, CTA, MRV, duplex ultrasound</td>
<td>Popliteal venous aneurysm, hypertrophied gastrocnemius heads</td>
<td>Aneurysm resection</td>
<td>Symptoms improvement</td>
</tr>
<tr>
<td>Ref (7)</td>
<td>3</td>
<td>N/A</td>
<td>N/A</td>
<td>Third gastrocnemius head</td>
<td>Partial resection</td>
<td>Symptoms relief (3)</td>
</tr>
<tr>
<td>Ref (11)</td>
<td>49</td>
<td>Skin changes 49.6%</td>
<td>Duplex ultrasound, venography, ambulatory venous pressure</td>
<td>N/A</td>
<td>Division of musculotendinous structures, ligation of perforating veins</td>
<td>Symptoms improvement apart from permanent damages</td>
</tr>
<tr>
<td>Ref (5)</td>
<td>1</td>
<td>Pain and swelling</td>
<td>Duplex ultrasound, MRV, ascending venography</td>
<td>N/A</td>
<td>Surgical division</td>
<td>Symptoms improvement</td>
</tr>
<tr>
<td>Ref (8)</td>
<td>1</td>
<td>Pain and swelling</td>
<td>Duplex ultrasound, ascending venography</td>
<td>Prominent popliteus muscle</td>
<td>Surgical division</td>
<td>Venographic improvement</td>
</tr>
<tr>
<td>Ref (6)</td>
<td>1</td>
<td>Pain and swelling</td>
<td>Duplex ultrasound, MRV</td>
<td>Hypertrophy of the medial and lateral gastrocnemius heads</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Ref (10)</td>
<td>1</td>
<td>N/A</td>
<td>N/A</td>
<td>Fibrous band</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

*CTA, Computed tomographic angiography; MRV, magnetic resonance venography.*

**Table.** Overview of the studies reported on isolated popliteal vein entrapment syndrome

852 Angeli et al  JOURNAL OF VASCULAR SURGERY September 2011
The imaging methods of choice in the reported cases are colored duplex ultrasound, ascending venography, and magnetic resonance venography, always performed in functional positions. The colored duplex ultrasound is a widely performed noninvasive test, with low cost and no radiation exposure. On the other hand, it remains an operator-dependent method, where skills and special training are required. In our case, this test had a false negative result.

The ascending venography has been the gold standard for many years. Typical venographic findings are normal venous anatomy in the neutral position, with considerable popliteal vein tapering and obliteration at the position of knee extension or at planter foot flexion, which was our case. The venous collateral network appearing at this point indicated the severity or even the chronicity of the entrapment. The impact of the previous venous surgery in this unusual venographic finding is unclear.

Magnetic resonance venography is a radiation free, noninvasive method, with the advantages of high quality imaging and of additional anatomic information. There is a trend of increasing MRV use, instead of ascending venography. Claustrophobia and cost are the drawbacks of the method. Due to rapid extravasation of the standard gadolinium chelate in the arterial phase, there may be a further need for blood-pool contrast agents and specified MRV protocols for optimal venous visualization. Unfortunately, in our institution, such infrastructure was not available at the time of the patient’s admission. Computed tomography venography presents nearly the imaging properties of MRV. Cost and the high radiation exposure are the main disadvantages.

Other sophisticated tests, such as air plethysmography and direct popliteal venous pressure recording, have also been used in clinical practice. These tests can be recruited in case of diagnostic problems or for research purposes.

Surgical exploration treats this syndrome in most cases, particularly when conservative treatment fails. The causative entrapment mechanism, usually a third gastrocnemius head, or an abnormal slip of the medial gastrocnemius head, a thick perivenous fascia, an hypertrophied popliteus muscle, a soleus aponeurosis of our case, is divided or partially resected.

Less than 50% of the surgically treated patients report total resolution of the calf pain or the swelling, while others benefit only partially. In the case of venous thrombosis and permanent wall damage, no improvement is expected. The Table presents an overview of the reported studies.

REFERENCES


Submitted Nov 8, 2010; accepted Jan 15, 2011.