Role of lower extremity fasciectomy plus fasciotomy for patients with persistent leg pain after stenting for chronic iliofemoral venous obstruction

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ABSTRACT

Although clinical improvement after stenting for symptomatic iliofemoral venous obstruction has been demonstrated in multiple large studies, a small proportion of patients will experience persistent quality of life—impairing symptoms. Swelling in such a setting represents the concomitant presence of lymphedema and will respond to treatment directed at the lymphedema. In contrast, persistent pain likely arises from venous hypertension in the lower leg, leading to the development of chronic compartment syndrome. Evaluation of intracompartmental pressures in such patients can help confirm the diagnosis, and fasciectomy combined with fasciotomy will treat the issue. In the present series, we evaluated six patients (six limbs) who had undergone fasciectomy combined with fasciotomy and their outcomes. (J Vasc Surg Cases Innov Tech 2022;8:616-9.)

Keywords: Chronic compartment syndrome; Chronic iliofemoral venous obstruction; May-Thurner syndrome; Post-thrombotic syndrome; Venous hypertension

Stenting for chronic iliofemoral venous obstruction (CIVO) has become the standard of care for patients presenting with quality of life—impairing manifestations for whom standard conservative therapy has failed.1-6 Although most patients will experience complete or at least partial improvement of their symptoms and/or signs to the point that no further intervention is required, a cohort of patients will experience persistent swelling (18%-35%) or persistent pain (11%-15%) that impairs their quality of life.7,8 Concomitant lymphedema will be the issue for patients with persistent swelling and will respond to complex decongestive therapy. In contrast, the pain component has been hypothesized to arise from chronic compartment syndrome (CCS) of the posterior superficial compartment (calf pump) due to venous hypertension, merit a different approach. For such patients, we will evaluate the intracompartmental pressure (ICP) in the posterior superficial compartment of the lower leg with the patient supine and at rest and after activity. When the ICP was elevated, we performed a combination of fasciectomy and fasciotomy. In the present report, we have described the diagnostic protocol, technique, and outcomes for a series of six patients (six limbs) who had undergone the procedure.

METHODS

We performed a review of prospectively collected electronic medical record data for a 4-year period from 2018 to 2021. The inclusion criteria were the presence of quality of life—impairing symptoms from CIVO despite initial conservative therapy, intravascular ultrasound (IVUS) findings confirming the diagnosis and/or stenting, and the use of fasciectomy plus fasciotomy for persistent pain due to CCS. Conservative therapy included the use of compression stockings, leg elevation when feasible, anticoagulation therapy when appropriate, and regular exercise as tolerated. IVUS (Visions PV 0.035 digital IVUS catheter; Philips, Amsterdam, Netherlands) confirmation of the diagnosis of CIVO was through the use of normal minimal luminal areas (125 mm², 150 mm², and 200 mm² in the common femoral, external iliac, and common iliac veins, respectively). Any luminal area reduction below these cutoffs merited stenting, which was performed using either a nondedicated composite stent configuration or a dedicated venous stent. The composite stent configuration involved the use of a Wallstent body (Boston Scientific, Marlborough, MA) and Zenith stent top (Cook Medical Inc, Bloomington, IN), with the latter used to overcome the iliocaval choke point effect. The dedicated venous stent used was the Venovo stent (Becton, Dickinson and Co, Franklin Lakes, NJ). The technique of stenting and the protocol for perioperative care have been reported in previous studies.5,9,10 Follow-up after stenting was lifelong in the form of a combination of clinic visits and duplex ultrasound examinations to evaluate the stent at regular intervals.

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Patients presenting with persistent pain that impaired their quality of life despite stenting to correct their CIVO underwent ICP measurements. The ICPs were measured using the STIC intracompartamental pressure monitor system (C2DX Inc, Schoolcraft, MI). An ICP >15 mm Hg either at rest or with activity was used to diagnose CCS. Fasciectomy and fasciotomy were performed using a 5-cm-long incision in the medial calf approximately two finger breaths posterior to the medial border of the tibia and three finger breaths inferior to the tibial condyle. After exposure of the posterior superficial compartment, a 5-cm × 5-cm area of fascia overlying the soleal muscle was excised with an additional fasciectomy and fasciotomy of the lower extremity for CCS. However, CCS in these compartments will not be due to venous hypertension but rather from a musculoskeletal etiology, such as occurs in chronic exertional leg deep vein thrombosis. Two of the six patients (33%) had had a diagnosis of a connective tissue disorder. Overall, improvement had occurred in the median visual analog scale for pain score and the venous clinical severity score for pain after fasciectomy plus fasciotomy compared with the scores after stenting. The clinical outcomes are presented in Table I. The median follow-up was 43 months (range, 11-84 months). Four of the six patients had undergone one or more stent reinterventions (total of six) before fasciectomy plus fasciotomy and one patient had undergone stent angioplasty 13 months after fasciectomy plus fasciotomy.

No major adverse events or complications associated with surgery had occurred in any of the six patients. In addition, issues pertaining to the wound, including delayed healing, were not encountered.

**DISCUSSION**

CCS due to venous hypertension is a relatively rare complication encountered in patients with CIVO. The culprit compartment is the superficial posterior compartment because it constitutes the calf pump with its extensive venous reservoirs. The deep posterior, anterior, and lateral compartments can also develop CCS. However, CCS in these compartments will not be due to venous hypertension but rather from a musculoskeletal etiology, such as occurs in chronic exertional leg deep vein thrombosis.
compartment syndrome or functional popliteal entrapment syndrome. The normal ICP is <15 mm Hg. We used a criterion of an ICP >15 mm Hg for symptomatic patients for the diagnosis of CCS due to venous hypertension and warranting surgery. Engelbert and Turnipseed had diagnosed CCS in a patient with a history of deep vein thrombosis and had proceeded with fasciotomy plus fasciectomy as the first option. However, in our experience and view, a thorough evaluation of the entire venous system in the limb is essential for an accurate diagnosis. Relief of any iliofemoral outflow obstruction should be provided initially before the diagnosis of CCS is considered. If, despite correction of any venous system abnormalities, the patient still experiences limiting pain, one should evaluate for CCS and corrective surgery pursued following confirmation of the diagnosis. This is important because such patients will often have other symptoms in addition to pain, which can also involve the thigh. Fasciectomy plus fasciotomy in the lower leg is unlikely to be helpful in such settings. Additionally, in the setting of lymphedema, such surgery can be detrimental with an increased likelihood of wound complications, including drainage. Furthermore, the cumulative incidence of CCS from venous hypertension warranting surgery was only 1.5% of patients who had undergone venous stenting for quality of life—limiting symptoms. Also, fasciectomy alone will be insufficient without an adequate fasciotomy, because once the fasciectomy has healed, the pain can recur owing to repeat restriction of muscle expansion. Another point is that all six of our patients had had a diagnosis of postthrombotic syndrome. Thus, these patients seem to have a higher risk of disruption of the venous milieu in the lower leg, with the onset of recalcitrant venous hypertension and the consequent development of CCS compared to patients with nonthrombotic iliac vein lesions.

The limitations of the present series included its small size and relatively short median follow-up. Also, ICP measurements require an invasive procedure, and fasciotomy plus fasciectomy is open surgery, with its own set of potential complications, including nerve injury, bleeding, and surgical site infection.

**CONCLUSIONS**

Patients with persistent leg pain impairing their quality of life after iliofemoral venous stenting for CIVO should be evaluated for CCS. A combination of fasciectomy and fasciotomy appeared to provide relief in our small cohort of patients. However, further study is required.

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**Table II.** Changes in clinical parameters after fasciectomy and fasciotomy

| Pt. No. | VAS score for pain | VCSS for pain |
|---------|-------------------|--------------|
|         | Before stenting   | After stenting | After FF | Before stenting | After stenting | After FF |
| 1       | 10                | 8             | NA       | 2               | 2              | 2       |
| 2       | 5                 | 5             | 4        | 2               | 2              | 1       |
| 3       | 8                 | 8             | 0        | 2               | 2              | 1       |
| 4       | 10                | 8             | 4        | 2               | 1              | 1       |
| 5       | 6                 | 6             | 3        | 2               | 1              | 1       |
| 6       | 10                | 8             | 7        | 2               | 2              | 2       |
| Total median score | 9               | 8             | 4        | 2               | 2              | 1       |

FF, Fasciectomy and fasciotomy; NA, not available; Pt. No., patient number; VAS, visual analog scale; VCSS, venous clinical severity score.
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