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CORRESPONDENCE

Transpopliteal Access for Intraoperative Spinal Angiography with Combined Percutaneous Treatment of Spinal Hemangioma

Sudhakar R. Satti[1] · Dharti Dua[1] · Ansar Z. Vance[2]

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Introduction

Spinal angiography is commonly performed in the setting of spinal arteriovenous malformations, preoperative embolization of spinal tumors, and intraoperatively. Spinal hemangiomas are highly vascular tumors that can be managed with combined transarterial preoperative embolization and surgical resection or vertebral augmentation.

When performing a combined spinal angiogram and embolization with subsequent vertebral biopsy and augmentation, the patient is generally intubated. The spinal angiography and embolization procedures are typically performed with the patient in the supine position via a traditional transfemoral access. At the completion of the angiogram and transarterial embolization, access site homeostasis is achieved with either manual compression or with the aid of a closure device. Depending on institutional protocols, many groin closure protocols may add 10–30 min. After hemostasis is achieved, the patient is then flipped into a prone position while still intubated and with fresh groin hemostasis. The second procedure requires another prep and drape, often with limited access to the previous groin access site, potentially adding 10–20 min to the case.

In this case report, we present our initial experience with combined left transpopliteal approach spinal angiography, transarterial embolization of a T10 vertebral body followed by immediate vertebral biopsy and vertebral augmentation. A single prone approach using a transpopliteal access enables a single prep, access and monitoring of the arteriotomy site, as well as significantly shorter procedure times.

✉ Sudhakar R. Satti
Ssatti@christianacare.org

[1] Department of Neurointerventional Surgery, Christiana Care Health System, 4755 Ogletown-Stanton Drive, Newark, DE 19718, USA

[2] Department of Interventional Radiology, Christiana Care Health System, Newark, DE, USA

Case

A 63-year-old African-American female with a past medical history of type 2 diabetes, hypertension, and hyperlipidemia. The patient presented with progressive back pain and bilateral lower extremity weakness and numbness/tingling for 1 month, which worsened over the week prior to presenting to the emergency department. Her lower extremity weakness progressed to the point that she felt as if her left leg was giving way and reported a fall from standing 1 month prior to admission. Otherwise, the patient denied recent trauma, infection, or loss of bowel or bladder continence. Although given a trial of steroids by her primary care physician, her symptoms did not improve and she complained of progressive difficulty with balance and ambulation.

On examination, the patient had a loss of sensation to light touch and mild left lower extremity weakness (her motor strength was 4+/5) involving the proximal extensors. She felt too off balance to ambulate without assistance, otherwise the neurologic examination was unremarkable.

Investigations

Computed tomography (CT) of the thoracic spine demonstrated an expansile mass with thick trabeculations (Fig. 1). Magnetic resonance imaging (MRI) of the thoracic spine with gadolinium enhancement demonstrated avid enhancement, flow voids and epidural extension of the mass resulting in moderate spinal canal stenosis and mass effect on the ventral thoracic cord (Fig. 2). A bone scan showed increased activity in the T10 lesion. All imaging findings were compatible with the diagnosis of a vertebral hemangioma at T10.

Procedural Technique

Left popliteal and mid-thoracic spine were prepped and draped using a sterile technique (Fig. 3). Left popliteal access was achieved with ultrasound-guided single-wall ar-

Fig. 1 Axial CT image at the T10 vertebral level of the vertebral hemangioma

Fig. 2 Axial T1 post-contrast fat saturated image through the T10 vertebral body level demonstrating soft tissue components of the hemangioma extending into the ventral epidural space and left anterolaterally into the thoracic cavity

Fig. 3 Left popliteal and mid-thoracic spine prepped and draped using sterile technique

teriotomy and placement of a Terumo 5F slender radial sheath (Terumo, Somerset, NJ, USA) attached to continuous flush (Fig. 4). A 100 cm Cook 5F Sim2 catheter (Cook, Bloomington, IN, USA) was formed over the aortic bifurcation and spinal angiography identified the dominant supply to the T10 vertebral artery from the left T10 segmental artery (Fig. 5). After distal coil embolization of the distal segmental artery to prevent non-target embolization, 150–250 µ Contour PVA particles were used to embolize the T10 vertebral body (Fig. 6). Bipedicular kyphoplasty was performed of the T10 vertebral body followed by 3.5 ml methyl methacrylate (VertaPlex HV, Stryker Spine, Allendale, NJ, USA) injection (Fig. 7).

Discussion

Vertebral hemangiomas (VH) are benign vascular lesions that are slow growing, frequently found in young women, and often incidental findings during routine imaging. They have a high incidence of 10–12%, although only 0.9%–1.2% are symptomatic [1, 2] and most often involve

Fig. 4 Left popliteal access site with Terumo 5 F slender radial sheath

Fig. 5 Co-axial 5 F Simmons 2 (Cook, Bloomington, IN, USA)/ Excelsior SL-10 microcatheter (Stryker Neurovascular, Fremont, CA, USA) angiography of the right T10 segmental artery demonstrating hypervascularity of the T10 vertebral body and collateral anastomosis to the right T11 segmental artery

the thoracic spine, particularly the posterior elements [3, 4].

There is no consensus on the best treatment modality for symptomatic VH. Treatment options include arterial embolization [5], intralesional ethanol injection, laminectomy, corpectomy, anterior column reconstruction, vertebroplasty, radiation therapy (RT) or a combination of the aforementioned approaches.

Intralesional ethanol injection has been associated with side effects, such as pathological fractures or cord injury

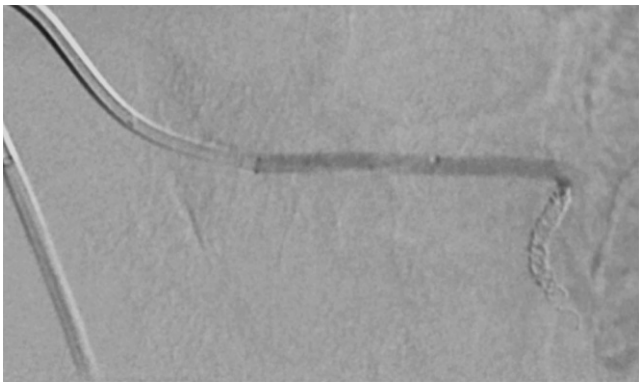

Fig. 6 Post-particle and distal coil embolization of the right T10 segmental artery demonstrating no significant residual hypervascularity within the T10 vertebral body

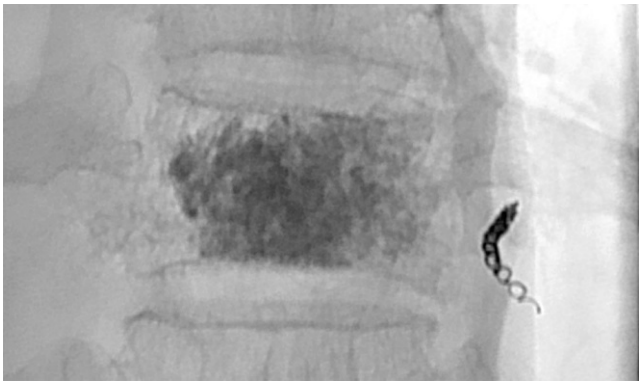

Fig. 7 Post-vertebral T10 bipedicular kyphoplasty and 3.5 ml methyl methacrylate injection

with significant short-term recurrences reported as well [6]. Radiation therapy does not result in immediate pain relief when used alone and has high rates of recurrence. Radiation therapy after subtotal surgical excision is associated with much lower rates of recurrence and this combined approach is favored in some institutions [3].

Surgical excision in aggressive VH is challenging due to their significant vascularity. Preoperative transarterial embolization is often performed with many considering this as the standard of care prior to surgical excision [7, 8]. Most vascular interventions are performed via the right common femoral artery approach. Alternative access sites such as transpopliteal access are increasingly being utilized in the setting of peripheral arterial intervention. Tonnesen et al. were the first to report high technical success and low complications in 50 percutaneous angioplasty procedures of the superior femoral artery via a retrograde popliteal artery approach [9].

Although the transpopliteal approach has been commonly used for treating peripheral arterial disease, to our knowledge a combined prone transpopliteal spinal angiogram and transarterial embolization with subsequent

percutaneous procedure has not been reported. The prone left transpopliteal approach is a rarely described approach to facilitate both procedures. We contend this arterial access is more time efficient, safer, and makes anesthesia care easier as the intubated patient is not flipped twice.

As recently published by Orru et al. [10], intraoperative spinal angiography can be very useful to assess the success of spinal arteriovenous malformation surgery. In their description, common femoral artery access is achieved with a long sheath and secured around the patients right lateral thigh and then secured. The patient is then placed prone and, as needed, during spinal surgery angiography can be performed through the long sheath.

Our case demonstrates the feasibility of transpopliteal approach spinal angiography, which would be even more advantageous to the operating room setting. In the operating room, prone spinal angiography using a transpopliteal access is likely faster (no need to get access supine then flip the intubated patient), inherently safer (continuous visualization of the access site), easier to achieve closure (manual compression), easier to maintain sterile access site/closure, and less likely to be associated with technical difficulties such as sheath kinking.

A potential limitation to transpopliteal access is catheter length because most neurodiagnostic catheters are 90–100 cm long. Given increased use of transradial neurovascular intervention, longer catheter lengths are readily available up to 125–130 cm (including Sim2).

Conclusion

Transarterial retrograde popliteal access for spinal angiography is fast, technically easy and safer in the setting of combined prone surgical or percutaneous spinal procedures when compared to traditional femoral access.

Conflict of interest S.R. Satti, D. Dua and A.Z. Vance declare that they have no competing interests.

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