



Hemodialysis patient with finger ulcerations

The patient reported pain and paresthesias of his left ring finger, and his left hand was cooler than his right. An angiogram helped us recognize the cause of his symptoms.

A 62-YEAR-OLD MAN with end-stage renal disease presented to our dermatology clinic with 2-month-old ulcerations on his distal left ring finger. He was on hemodialysis and had a radiocephalic arteriovenous fistula (AVF) on his left arm. He had been empirically treated elsewhere with oral trimethoprim-sulfamethoxazole for a presumed bacterial infection, without improvement. He was then treated for contact dermatitis with topical clobetasol, which led to ulcer expansion and worsening pain.

At our clinic, the patient reported intermittent pain in his finger and paresthesias during activity and dialysis, but no tenderness of the ulcers. He had atrophy of the intrinsic left hand muscles (his non-dominant hand) with associated weakness. Three weeks earlier, he'd received a blood transfusion for anemia. Afterward, the pain in his hand improved and the ulcers decreased in size.

On exam, the AVF had a palpable thrill over the left forearm. The radial pulses were palpable bilaterally (2+) and the left ulnar artery was palpable, but diminished (1+). The patient's left hand was cooler than the right (with a slight cyanotic hue and visible intrinsic muscle atrophy) and had decreased sensation to pain and temperature. Four ulcers with dry yellow eschar were located over the dorsal interphalangeal joints (FIGURES 1A AND 1B). They were essentially non-tender, but there was tenderness in the adjacent intact skin. There was violaceous blue edematous congestion noted on the fourth finger, and the distal phalange was constricted, giving it a "pseudoainhum" appearance.

- WHAT IS YOUR DIAGNOSIS?
- HOW WOULD YOU TREAT THIS PATIENT?

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FIGURES 1A AND 1B

Treatment with topical clobetasol made the 4 ulcers worse



IMAGES COURTESY OF SAHAND RAHNAMA-MOGHADAM, MD, AND THE AUDIE L. MURPHY MEMORIAL VA HOSPITAL

Diagnosis: Dialysis access steal syndrome

We suspected dialysis access steal syndrome (also known as AVF steal syndrome), so a duplex ultrasound was performed. The ultrasound was inconclusive. (We couldn't confirm a limitation in blood flow, nor delineate anatomy.) So, we referred the patient for a thoracic and upper extremity angiogram.

The angiogram demonstrated multifocal, moderate to severe, areas of stenosis at the distal left brachial artery. The radial artery was patent at the level of the wrist, but showed diffuse narrowing beyond the level of the arteriovenous (AV) anastomosis. There was only a faint palmar arch identified on the radial aspect of the hand with digital branches feeding the radial portion of the hand. In contrast, the ulnar artery was not seen within the mid- and distal forearm (FIGURE 2). Palmar branches to the ulnar half of the hand were not identified. The fistula itself didn't show any stenosis.

Based on these findings, our suspicions of dialysis access steal syndrome were confirmed.

Dialysis access steal syndrome is caused by a significant decrease or reversal of blood flow in the arterial segment distal to the AVF or graft, which is induced by the low resistance of the fistula outflow. Patients with adequate collateral vasculature are able to compensate for the steal effect; however, patients with end-stage renal disease typically have preexisting vascular disease that increases the risk for vascular steal and, ultimately, demand ischemia after placement of an AVF.¹ Interestingly, a steal effect occurs in 73% of patients after AVF construction, yet it is estimated that only 10% of patients demonstrating a steal phenomenon become symptomatic.²

■ **In our patient's case**, the vaso-occlusive properties of topical steroids explain why the superpotent steroid (clobetasol) he was prescribed increased his pain and worsened the underlying problem.

A broad differential; a useful exam maneuver

The differential diagnosis of ulcers includes infection (mainly from bacterial or mycobacterial sources), trauma facilitated by neuropathy (neuropathic ulceration), vasculitis, and ischemia. When the history and physi-

cal exam suggest ischemic ulceration, then thromboembolism, thoracic outlet syndrome, vasculitis, atherosclerosis, and steal syndrome become more likely causes.

Signs and symptoms of ischemic steal syndrome are initially subtle and include extremity coolness, neurosensory changes, intrinsic muscle weakness, ulceration, and ultimately, gangrene of the affected extremity.^{3,4} A cold, numb, and/or painful hand during dialysis is another clue.³ Factors that increase the likelihood of the syndrome include age >60 years, female sex, and the presence of diabetes or peripheral artery disease.^{2,3,5,6}

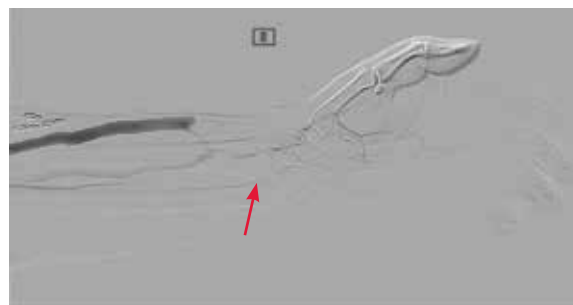
One physical exam maneuver that can help make the diagnosis of steal syndrome is manual occlusion of the AVF. If palpable distal pulses disappear when the AVF is patent and reappear when the fistula is occluded with downward pressure, then AVF steal syndrome is likely.⁴ Pain at rest, sensory loss, loss of pulse, and digital gangrene are emergency symptoms that warrant immediate surgical evaluation.³

■ **Tests will confirm suspicions.** Doppler ultrasound can be used to assess changes in the blood flow rate of the affected vessels when the AVF is patent vs when it is occluded. Similarly, pulse oximetry can be used with and without AVF occlusion to compare changes in oxygen saturation. The confirmatory diagnosis, however, is made via a fistulogram (angiography) with and without manual compression.⁶ Images taken after dye injection into the AVF show dramatic



The confirmatory diagnosis of steal syndrome is made via a fistulogram (angiography) with and without manual compression.

FIGURE 2
Patient's angiogram was revealing



An upper extremity angiogram revealed multifocal, moderate to severe, areas of stenosis (arrow) at the distal left brachial artery. The ulnar artery could not be visualized within the mid- and distal forearm.

FIGURE 3

Finger could not be saved



Distal revascularization was attempted, but the patient's gangrene progressed. Surgical amputation of the left fourth finger was performed at the metacarpal's proximal metaphyseal flare.

improvement of distal blood flow with AVF compression.

Treatment requires surgery

Severe steal-related ischemic manifestations that threaten the function and viability of digits require surgical treatment that is primarily di-

rected toward improving distal blood flow and secondarily toward preserving hemodialysis access. Several surgical treatments are commonly used, including access ligation, banding, elongation, distal arterial ligation, and distal revascularization and interval ligation.^{2-5,7}

■ **Our patient.** Distal revascularization was attempted, but unfortunately, the patient's gangrene was progressive (FIGURE 3) and surgical amputation of the left fourth finger was performed at the metacarpal's proximal metaphyseal flare. The patient was transitioned to peritoneal dialysis to avoid further ischemia. **JFP**

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