Left hand ischemia secondary to steal syndrome after subclavian artery intervention in a hemodialysis patient with arteriovenous fistula

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Introduction

- Hemodialysis is the most common renal replacement therapy for advanced chronic kidney disease, with a mature arteriovenous fistula (AVF) as the preferred access modality.
- AVF associated steal syndrome is a known complication in hemodialysis patients, particularly in those with underlying vascular disease.
- The development of clinically significant steal following proximal arterial intervention is uncommon and underreported.

Case Description

Patient presentation

- A 48-year-old man presented with unstable angina and severe hypertension.
- The patient had a past medical history of hypertension, diabetes and end stage renal disease (ESRD).
- He was on hemodialysis with a functional left upper-extremity AVF and a right subclavian vein tunneled hemodialysis catheter.
- He also had a prior history of coronary artery bypass grafting with a left internal mammary artery (LIMA) graft to the left anterior descending artery (LAD).

Initial work-up

- Coronary angiogram showed occlusion of all native coronary arteries with patent LIMA to LAD and saphenous vein graft to the right coronary artery.

Case Description (continued)

- The left subclavian artery showed a hemodynamically significant proximal stenosis with 40 mm Hg pressure gradient on pull back.
- The patient was placed on intensive anti-anginal therapy but reported limiting exertional chest pain.

Diagnosis and Management

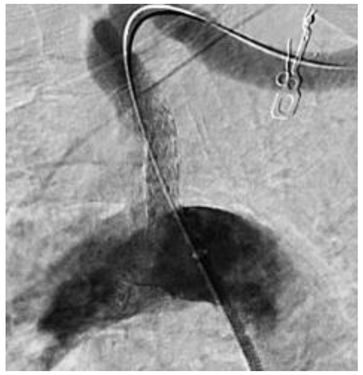

Figure 1. Subclavian angiogram post stent

- Vascular imaging confirmed very severe stenosis of the left subclavian artery proximal to the origin of the vertebral artery.
- Stenting of the left subclavian artery was done with successful restoration of antegrade flow to the LIMA and left upper extremity (Figure 1).
- After the intervention, patient experienced new symptoms of severe numbness and pain in the left hand, raising concerns of ischemia.
- Distal perfusion was diminished on examination. A physiologic steal study demonstrated digital pressures below 50 mm Hg in all five digits of the left hand at rest, with improvement during manual compression of the AVF.
- These findings were consistent with AVF-associated steal syndrome and implied that increased inflow following revascularization resulted in preferential diversion of blood through the fistula with compromised distal perfusion.

References

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Outcome

- Treatment focused on flow-reduction strategies including fistula revision or ligation.
- The patient opted for fistula ligation since he preferred ongoing dialysis via the existing tunneled catheter.
- Hand perfusion and sensory symptoms improved following intervention.
- At follow-up, the patient continued hemodialysis via the subclavian catheter. Care required coordination between nephrology, cardiology, vascular surgery, and interventional radiology.

Discussion & Conclusion

- Proximal arterial intervention in an ESRD patient carries a risk of disrupting hemodynamic balance and precipitating ischemia.
- AVFs act as low-resistance pathways, and restoration of proximal arterial inflow can increase shunt flow, diverting blood away from the distal extremity and causing ischemia.
- Post-intervention steal is difficult to diagnose and may mimic stent failure or embolization. Improvement with AVF compression is a key diagnostic clue.
- Steal syndrome post subclavian artery intervention in ESRD patients with AVF is uncommon but clinically significant. Awareness of this complication and early recognition is imperative to prevent irreversible ischemic injury.
- This case underscores the importance of thoughtful vascular assessment and coordinated care when managing proximal arterial disease in high-risk dialysis patients.