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The incidence of upper limb ischemic symptoms in patients with hemodialysis access fistulae is between 6 and 20%, the higher percentage representing brachial artery fistulae and prosthetic grafts. The principal causes of limb ischemia are occlusive arterial disease and “arterial steal.” In studies of patients with fistulae, 80 to 94% demonstrate retrograde arterial flow, arterial steal, in the radial or ulnar arteries. The absence of ischemic symptoms in the majority means that the flow to the hand remains adequate. It is likely that patients with atherosclerosis affecting the palmar arch and digital arteries are most at risk of developing symptoms.

The diagnosis of ischemia is often clinically obvious with a threatened limb or a cold hand with absent distal pulses that return when the fistula is compressed. However, the diagnosis may be subtle and difficult to differentiate from diabetic neuropathy, carpal tunnel syndrome, sympathetic dystrophy, and venous hypertension. No single preoperative test is sensitive and specific for the development of ischemia. Digital palpation of the radial and ulnar arteries, Allen's test, and hand-held Doppler examination are adequate assessment prior to fistulae at the wrist. For brachial fistulae, lower limb fistulae, and tertiary procedures, the arteries should be formally imaged with duplex or angiography. The risk of ischemia is reduced if a more distal fistula is created whenever possible using autologous vein with an end-to-side anastomosis.

The aim of management of established ischemia is to preserve both access for hemodialysis and an intact limb. Patients with normal fistula flow and no evidence of arterial steal must have a compromised upper limb arterial supply owing to coexisting occlusive arterial disease or arterial injury. The key step to management is to identify the sites of all hemodynamically significant arterial stenoses, which are then best treated by percutaneous angioplasty. A subsequent access procedure in the contralateral limb carries a high risk of ischemic complications, so alternative options should be considered, including grafts from the suprascapular or thoracic arteries, a lower limb procedure or even conversion to peritoneal dialysis.

Ischemia owing to arterial steal from the palmar arch by a radial-cephalic fistula is cured by simple ligation of the artery distal to the fistula when the ulnar artery is patent. If the collateral supply is inadequate or the fistula is brachial, simple ligation may be inadequate to correct ischemia. In these patients, distal revascularization is combined with interval ligation (DRIL, after Schanzer 1998).

The DRIL procedure has been shown to improve hemodynamic flow and perfusion of the limb in nine clinical studies (relief ischemia 83 to 100%, fistula patency 71 to 100%). The theoretic risk of the DRIL procedure, thrombosis of the graft with acute limb ischemia, has never been reported in the literature.

Fistula plication and banding to increase fistula resistance have been largely abandoned. Once the band is applied sufficiently tightly to reduce fistula flow, there is a high incidence of thrombosis.

In summary, hand and finger ischemia are important and often under-recognized complications of renal access surgery. Care in fistula planning and creation is vital to identify at-risk patients and preexisting arterial stenoses and to avoid arterial damage. Established ischemia is relieved using percutaneous angioplasty, the DRIL procedure, or simple ligation of the distal artery. Many of the same issues pertain to lower limb access. Ischemia is often the consequence of the systemic disease process, not the fistula itself, and these patients pose the greatest challenge to the surgeon.