

Digital Gangrene in End-Stage Renal Disease

Sajad Ahmad Salati, Saad Abdullah-al-Subaie and Sari M. Rabah

ABSTRACT

Ischemic complications presenting as digital gangrene occurring in a patient of end-stage renal disease undergoing haemodialysis is rarely reported in literature. We report one such case of dry gangrene of a single finger in a 53 years old male undergoing haemodialysis. The condition was likely a steal phenomenon secondary to the surgical angioaccess for dialysis.

Key words: Dry gangrene. End-stage renal disease. Angioaccess. Haemodialysis. Steal syndrome. Ischemia. Brachio-basilic fistula.

INTRODUCTION

In the patients of end-stage renal disease, arteriovenous fistulae are created to secure angioaccess for long-term haemodialysis. This procedure can lead to various short and long-term complications which include vascular compromise of the affected limb.¹ If not detected in early stages, tissue necrosis can occur, which might require amputations and result in disabilities. However, if ischemic changes are detected in time, then there are multiple remedial options available depending upon the condition of the patient and the availability of facilities.

CASE REPORT

A 53 years old right handed male reported with a dry gangrene of right index finger. The patient was diabetic, hypertensive and hypercholesterolemic, undergoing regular haemodialysis for end-stage renal disease for the last 7 years. During the course of his renal disease, arteriovenous shunts had been surgically created twice. Once Brescia-Cimino fistula was formed over distal right forearm 7 years back and later a more proximal autogenous brachio-basilic fistula had been created one year back after the malfunction of former fistula. After the creation of brachio-cephalic fistula, patient had been occasionally feeling pain in the right hand. The involved finger had turned dusky one month back and gradually shriveled up.

On examination, the patient was hemodynamically stable and afebrile. The right hand had minimal edema and dry gangrene of index finger involved middle and distal phalanges with a clear demarcation line (Figures 1, 2). There was no neurological deficit over the rest of the hand. Both the radial and ulnar pulses were

palpable and color, turgor and capillary return was normal over rest of the hand.

Basic laboratory parameters including complete blood counts, serum electrolytes and coagulation profile were within normal limits. Since the affected finger had advanced gangrene with clear demarcation, amputation was carried out at the level of proximal phalanx under regional anaesthesia with uneventful postoperative period. The patient did not develop any further ischemic complications during 9 months follow-up.



Figure 1: Palmar surface of right hand showing gangrenous right index finger.



Figure 2: Dorsal surface of hand as shown in Figure 1 with gangrenous index finger and edema.

DISCUSSION

Hand ischemia following surgically created arteriovenous fistula for angioaccess and haemodialysis is a potentially disabling complication.¹ If severe and left untreated, it can lead to irreversible neurological dysfunction or hand / digital gangrene as happened with our case. Clinically significant distal extremity ischemia has been reported to occur in 5-10% of all individuals when brachial artery is used for dialysis access placement.²

There are no factors by which one can surely predict the likelihood of vascular complications in a particular case though the predisposing risk factors reported in the literature include female gender, age > 60 years, Diabetes, atherosclerosis, diffuse vessel disease, multiple previous access procedures on the same arm and the use of the brachial artery as the donor vessel.³

The pathophysiology of ischemic complications like digital gangrene is not definitely established though

Department of Plastic and Reconstructive Surgery, King Fahad Medical City, Riyadh, KSA.

Correspondence: Dr. Sajad Ahmad Salati, Department of Plastic Surgery, King Fahad Medical City, Riyadh, KSA.
E-mail: docsajad@yahoo.co.in

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multiple pathways are proposed. Chronic haemodialysis induces the formation of atherosclerosis by increasing the plasma homocysteine, TGF- β 1 and lipoprotein-A levels,⁴ and atherosclerosis constitutes a risk factor for the development of gangrene *per se*. Secondly, due to the insufficient filtering in the chronic haemodialysis patients, micro-emboli (debris) can enter the circulation from the equipment. These micro-emboli can potentially lead to acute arterial occlusion and, consequently, gangrene.⁵ Furthermore, selective digital venous hypertension due to arterialization of the veins can also lead to gangrene.⁶ The steal syndrome following AV-fistula has an asymptomatic form, the so-called "physiological steal" which occurs in 80% of the patients.^{1,7} It is a demonstrable drop in blood pressure at the periphery and is compensated by the arterial collateral circulation and vasodilatation. If these mechanisms fail, the ischemic symptoms tend to occur, more frequently when brachial artery is used for angioaccess and less frequently in distal fistulae.^{1,7} Its manifestations include cold sensation and pallor of the limb, pain while working or during dialysis (claudication), decrease in sensitivity, cramps and pain while resting, the development of ulcers, infections, necrosis and tissue loss. In this case, the most likely cause for digital gangrene seemed to be micro-emboli as the rest of the affected hand did not show any features of vascular compromise for 9 months of follow-up.

It is not difficult to diagnose the clinical manifestations of vascular compromise even if the patient reports in late stages, like our reported case. Salvage of digits / hand in these late stages is difficult requiring extensive surgical operations like free flap transfers⁸ and generally the result is usually amputations and disabilities. Hence, efforts need to be made to prevent disasters by timely recognition of the early ischemic manifestations by being aware of ischemic complications of angioaccess and taking serious note of complaints which could potentially be due to early ischemia through physical examination. Duplex Doppler ultrasound (DDU) evaluation with finger pressures and waveform analysis, and angiography should be done as and when required.

Once the diagnosis of ischemia is established, the ultimate treatment strategies are based on the severity of symptoms, the extent of patient co-morbidity, and the available expertise. In recent literature, multiple options are mentioned to tackle this complication which includes angioembolisation, banding of haemodialysis access, angioplasties of radial/ulnar arteries and distal revascularization with interval ligation (DRIL).^{9,10}

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