An unusual cause of venous hypertension

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Abstract

The gold standard vascular access for hemodialysis is the arteriovenous fistula (AVF). Venous hypertension (VH) is an unusual complication of AVF, which can be misdiagnosed as cellulitis due to the similarities in clinical presentation. Here we present a case of venous hypertension in a 40-years-old gentleman, who presented with progressive pain and swelling of three lateral fingers of his left hand without other inflammatory signs after a year of AVF creation. Further evaluation with a duplex scan supported the clinical diagnosis of VH. He had undergone a surgical ligation of AVF and completely recovered from the symptoms.

Introduction

The most common modality for renal replacement therapy is hemodialysis.[1] Vascular access for hemodialysis is achieved by a central venous catheter (tunneled or non-tunneled), arteriovenous fistula (AVF), arteriovenous grafts (AVG) or via endovascular approach (endoAVF).[2,3] The gold standard vascular access for hemodialysis is the arteriovenous fistula (AVF), and the first choice for AVF is autologous AVF, as it has higher patency rate than non-autologous AVF. Though AVF can be created whole over the body, the upper extremity is preferable because it is associated with fewer complications.[4] The recommended sites for arteriovenous fistula are in the order of radiocephalic (RCF), brachiocephalic (BCF) and basilic-vein transposition. Preferably, AVF is created in the non-dominant arm.[5] Mainly four different surgical anastomosis techniques are available for creating the AVF. There is side artery to side vein anastomosis, end artery to side vein anastomosis, end artery to end vein anastomosis, and side artery to end vein anastomosis.[4,6]

Although an arteriovenous fistula is the best access with the least complications for hemodialysis, hemodynamic and non-hemodynamic complications are reported; hemodynamic complications of AVF are stenosis, thrombosis, aneurysm, hematoma, venous hypertension, dialysis access-associated steal syndrome (DASS) and congestive cardiac failure. The most reported non-hemodynamic complication is an infection that is responsible for 20% of access-related complications.[3-5]

Considering hemodynamic complications, many studies have reported that stenosis is the most common complication and its progression causes thrombosis and is responsible for up to 85% access abandonment but, regarding venous hypertension, only one study has stated that venous hypertension that needed intervention was less than 1%.[7-9]

Here we share our experience of managing venous hypertension after side-to-side radio-cephalic fistula.

Case presentation

A 40-years-old patient with a known history of chronic kidney disease (CKD) underwent a left radiocephalic fistula a year ago. This fistula had not matured enough, so he was up on dialysis with a right side-tunneled line into the internal jugular vein. He presented with progressive pain and swelling of the left hand, mainly the lateral three fingers, for eight months duration. The swelling was confined to the hand. He didn't have some neurological impairment or ischemic features like necrotic fingers. He also denied any history of fever.

Upon examination, he had a thrill only confined to the anastomosis and hand swelling mainly in the thenar eminence and three lateral fingers. There was no evidence of cellulitis and distal perfusion was satisfactory. The clinical diagnosis of venous hypertension has arrived. The duplex scan revealed a patent side-to-side anastomosis of radiocephalic fistula with evidence of diverted retrograde flow to dilated distal digital veins that communicate with the fistula. However, we couldn't exclude the juxta-anastomotic venous stenosis or proximal vein stenosis, as computed tomography (CT) venography was not cost-effective in our limited resource setting. So it was decided to ligate the fistula to alleviate his symptoms. After the ligation, his symptoms slowly improved. After 2 weeks of ligating this fistula, we created a brachiocephalic fistula on the same side.

Discussion

Venous hypertension (VH) is one of the unusual complications of AVF.[10] It results from venous stagnation due to an imbalance between access flow and the outflow resulting from venous vascular resistance due to vein stenosis or valvular incompetence or reflux or diverted the retrograde flow of the AV access outflow vein.[3,11] Common sites for stenosis are near the anastomosis in RCF and cephalic arch stenosis in BCF.[1] Venous hypertension throughout the upper limbs occurs in the case of central venous stenosis, or cephalic arch stenosis.[11]

The incidence of venous hypertension is higher in side-to-side anastomosis than in end-to-end anastomosis. Even though side-to-side anastomosis has a simple procedure technically, the most commonly used tech-

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nique is end-to-side anastomosis due to the definite risk of venous hypertension. But this can be prevented or cured by ligation of the distal run-off vein as a functional side-to-end anastomosis is created.[6] History of central venous catheter placement is a risk factor for VH.[11]

VH interferes with therapy and the quality of life. It causes symptoms such as pain and swelling of the upper limb, with decreased range of motion, ulceration, pigmentation, skin necrosis, neuralgia and dermatosclerosis of the upper limb.[11,12]

Due to the similarities of symptoms, it can be misdiagnosed as cellulitis and delayed treatment, which may lead to gangrene and loss of limb. Therefore, suspected cases should be evaluated with careful clinical examination. In VH, the extent of the edema varies and depends on which segmental veins are involved. Edema is predominantly seen in the lateral three fingers with thenar eminence and the medial two fingers with hypothenar eminence when it involves the cephalic vein and basilic vein, respectively.[10,13] Cellulitis is more likely when the swelling is more prominent on the dorsal surface and involvement of the midpalmar space. VH is more likely when pain and swelling worsen with the dependent position and decreases with limb elevation. When the clinical diagnosis is unclear, it should be further evaluated with imaging.[14] Our patient had swelling that mainly involved the hypothenar space, rather than the dorsal aspect.

Figure 1. Initial presentation.

Figure 2. Complete recovery after surgical ligation of arteriovenous fistula.

For asymptomatic and symptomatic patients, venous Duplex ultrasound is a good screening tool for diagnosis. Diagnosis is confirmed by venogram or non-invasive imaging such as magnetic resonance imaging (MRI) venogram/CT angiogram. The area of stenosis, reflux and its extent were identified in a contrast study.[12] In our case, with symptoms and signs, we arrived at a clinical diagnosis of VH. Duplex scan findings supported the clinical diagnosis as it showed diverted retrograde flow in dilated digital veins that communicate with the radio-cephalic fistula. Anyhow, we couldn't exclude the juxta-anastomotic venous stenosis or proximal venous stenosis, as we couldn't obtain a CT venogram, which leads to the inability to make a diagnosis precisely.

Management options for VH are open surgical and/or percutaneous catheter-based techniques. When it is due to stenosis, percutaneous treatment has emerged as a safer, easier, and minimally invasive procedure. Though trans luminal angioplasty and endovascular stent are the alternative options for the preservation of AVF, their long-term patency rates aren't favorable.[14]

Non-salvage treatment modalities include angiographic embolization and ligation of AV assessment. When venous hypertension is present, open surgical techniques are difficult to perform due to extensive edema, and thickening of the skin and there is a high risk of bleeding.[14] The closure of AVF with surgical ligation should be done only after the above salvage options are exhausted/are not feasible or venous hypertension secondary to reverse stealing veins or central vein occlusion as it is unamenable to venoplasty.[3] In this study, we performed surgical ligation because the reason for VH was diverted retrograde flow in distal veins. In addition to this fistula, the segment also was not insufficient for dialysis. After 2 weeks of ligating this fistula, we created a brachiocephalic fistula on the same side.

Conclusions

Even though venous hypertension (VH) is an unusual complication of AVF, it needs a careful clinical evaluation as it can mimic cellulitis and delay in diagnosis may lead to loss of limb.

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