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Brachial Artery Aneurysm after Arteriovenous Fistula Ligation Status Post-Kidney Transplant

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INTRODUCTION

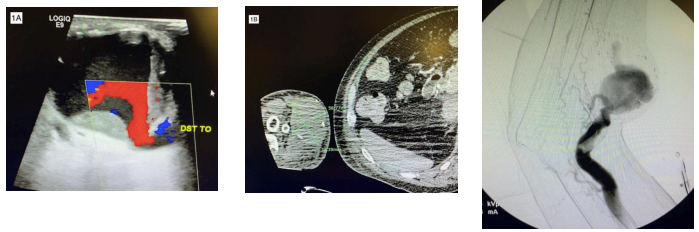
Arteriovenous fistulas (AVF) are the most common and effective method of receiving hemodialysis, however these access techniques do not come without consequence. Aneurysmal degeneration after creation and even years after ligation of such AVF can occur. This is still considered a rare complication. A true brachial artery aneurysm has an overall incidence of 0.17% among peripheral artery aneurysms[1]. Factors that increase incidence of this complication include trauma, age and immunosuppression. Research on this topic is becoming more prevalent, but more answers are still needed. Below is a case of brachial artery aneurysm presenting years after AVF ligation in a patient with kidney transplant.

CASE PRESENTATION

This is a 68-year-old male past medical history atrial fibrillation, stroke, deep vein thrombosis who presented to the emergency department for shortness of breath due to CHF exacerbation. Incidentally, patient also reported that a pulsating mass in his right upper extremity had recently increased in size. Further past medical history is significant for end stage renal disease secondary to focal segmental glomerulosclerosis requiring hemodialysis (HD) via right upper extremity (RUE) AVF, subsequently undergoing cephalic vein ligation years prior for steal syndrome and significant venous congestion. Hemodialysis no longer required as patient status post renal transplantation in 2006, still on Cyclosporine and Mycophenolate sodium.

CLINICAL COURSE

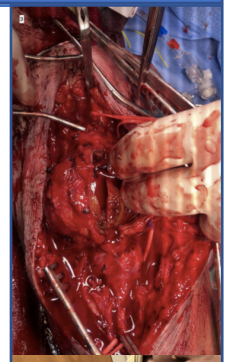
- RUE duplex ultrasound (US) obtained which is seen in Figure 1A. This demonstrated a thrombosed basilic vein, stent, and two large fusiform aneurysms (5.8x7.0x4.5cm partially thrombosed with patent lumen and 2.7x2.6x2.4cm more peripheral). Figure 1B shows RUE CT Angiography showing a 7.3x5.9x5.7cm fluid collection in antecubital fossa and 3.2x2.1x3.0 aneurysm and 2.9x2.1cm amorphous fluid collection radial aspect of wrist.



- Decision made to plan for RUE arteriogram when able to avoid contrast nephropathy to transplanted kidney and also when patient more medically optimized. This was accomplished after a few days. A pulsatile mass with right brachial artery aneurysm is visualized in Figure 2.

CLINICAL COURSE CONTINUED

- RUE angiogram and open repair brachial artery aneurysm with 8mm Gore-Tex graft performed two days later. Angiogram showed massive size of artery aneurysm with multiple collaterals and outflow brachial artery that was very tortuous. Attempted to cross the outflow artery but ultimately unsuccessful at being after to placed covered stent across aneurysm endovascularly. Switched to open approach at this time.
- Aneurysm incised and large amount of clot removed, noted in Figure 3. Multiple collaterals required suture ligation to maintain hemostasis. Tailored an 8mm Gore-Tex graft in cobra head fashion. Anastomosis made between the inner ring of the graft and the hood of the inflow native non-aneurysmal brachial artery with 6-0 Gore-Tex suture in running fashion. Distal anastomosis created between end of graft and distal brachial artery in the same fashion.
- Clamps removed with subsequent flow confirmed by doppler across brachial artery and graft, as well as distal brachial artery past the anastomosis. Radial pulse palpated at this time and reconfirmed with doppler signal.
- Post-operatively, radial pulse remained palpable with warm and pink fingers. Did require manual hematoma evacuation from incision at bedside twice and compression dressings. Ultimately, POD#7 a wound vac was placed at surgical incision to aid in fluid evacuation.
- Pathology report of right arm grumous showed mostly organizing thrombus with rare strips of fibrovascular connective tissue, no malignancy.
- Patient seen in follow up closely for months following the procedure. Surgical site noted to be well healed as seen in Figure 4 with adequate blood flow through graft to the hand.



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DISCUSSION

Arteriovenous fistulas have various complications, a rare one being a true aneurysm status post ligation. It is more common to see peripheral aneurysms at the anastomosis or site of repeated puncture[2]. When it comes to true aneurysms, the definition is permanent localized dilation of an artery having at least a 50% increase in diameter compared to the expected normal diameter of the artery in question[3]. This occurrence was first described in 1757 by John Hunter[4]. Multiple mechanisms contribute to the pathophysiology. These are usually of infectious, post-traumatic or iatrogenic etiology[5]. Wall stress due to high flow can lead to aneurysms[2]. This is the theorized mechanism for the above case. The hyperdynamic flow puts the proximal arterial portion at increased risk of atherosclerotic change[6]. Studies have shown that the pathology of the walls in arteries that were proven to have undergone degeneration look similar to arteriosclerotic aneurysms[2]. There are multiple complications that can arise from true upper extremity aneurysms, the most feared being thromboembolization or rupture. Unfortunately, size does not correlate to symptoms[7]. Therefore, decision to treat should not be based solely on size and symptoms. Specifically, distal ischemia can develop without any warning signs[7]. This risk of limb loss highlights the importance of prompt diagnosis. When peripheral arterial aneurysms are suspected, one can start with noninvasive ultrasound studies. This can be further delineated with computed tomography or magnetic resonance angiography. However, the gold standard is selective upper extremity arteriography. Upon diagnosis, early surgical intervention is the next best step with reported low morbidity, high success rate. Operative repair is the best therapeutic option[8]. The brachial artery can be approached open but endovascular repair can be attempted first. However, this is noted to be difficult for many reasons such as in our case where the lesion was not able to be crossed most likely due to tortuosity or anatomy itself[9]. When it comes to open repair, the brachial artery can be exposed above the elbow. The superficial basilic vein should be avoided. The neurovascular sheath can be incised to expose the artery. The incision can be extended across the antecubital fossa and down the forearm. Conduits for revascularization preferably are autologous veins that can be connected distally to radial and ulnar arteries. Saphenous vein (GSV) harvests are most common but an autologous vein can be harvested from the contralateral arm if needed as well. Some studies even reported the ability to use the ipsilateral upper extremity vein through reconstruction in order to have less dissection and preserve the GSV for future intervention[9]. The bypass conduit can be tunneled subcutaneously. PTFE can be used in segments or as the graft in cases with concern for higher risk of thrombosis or steal syndrome[9]. Another option is arterial reconstruction if there is not adequate perfusion to the hand with primary anastomosis.

CONCLUSION

AVF for dialysis access is a common procedure, but it is not without consequence. A rare complication that can occur even years after arteriovenous fistula access creations is aneurysmal degeneration. This was a case report of a patient who had his AVF ligated status post kidney transplant but developed a true brachial artery aneurysm over ten years after his surgery. Our transplant patient has the increased risk factor of immunosuppression. There are reports of similar in the literature, however it is still an infrequent occurrence. The safest approach to this diagnosis is to take the patient to surgery. An endovascular repair is attempted, but if unsuccessful then an open approach may be required. Either way, the aneurysm can be bypassed or stented with the goal of decreasing the risk of rupture and maintaining distal perfusion to the hand. Better long-term outcomes are needed to compare endovascular vs open approach for these lesions.