Improvement of Pulmonary Hypertension In A Transplant Patient

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Abstract:

Pulmonary hypertension is not an uncommon finding in patients on hemodialysis. This is usually cardiac in origin including left ventricular failure or diastolic dysfunction. Arteriovenous fistula causing high flow in the venous return may lead to pulmonary hypertension and right sided failure. We here report a patient with pulmonary hypertension post kidney transplantation that did not respond to management over a period of 3 years and ultimately improved significantly after closure of arteriovenous fistula created for hemodialysis pre-transplant.

Key words: *Pulmonary hypertension, arteriovenous fistula, echocardiography, pulmonary arterial pressure.*

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Introduction

Pulmonary hypertension (PH) is defined as pulmonary arterial pressures of >20 mm Hg.[1] PH is highly prevalent in patients with chronic kidney disease (CKD) and patients on dialysis. The prevalence of pulmonary hypertension in dialysis patients varies in different studies from 17% to 49.53 % depending in the mode of dialysis and other co- morbidities. [3]

PH is present both in hemodialysis and peritoneal patients however, much less in the later population. [3] The disease is usually diagnosed late in its course as it presents with various nonspecific symptoms. The patients who are diagnosed in later part of illness with partially closed or unclosed A-V fistula present with symptoms of high output cardiac failure , hypertensive heart disease and left ventricular dysfunction. A reversible etiology if present, must be diagnosed as early as possible to initiate appropriate intervention. We

here present a case of PH that responded to the closure of AVF with marked improvement in her symptoms and echocardiographic findings.

Case Report:

Sixty five years old female patient with history of long standing hypertension and diabetes for over 25 years was diagnosed with CKD -5 in December 2007. Left upper arm brachiocephalic arterio-venous fistula was created and hemodialysis initiated 8 weeks later. She remained on hemodialysis for one and half year before she received living non-related kidney transplantation.

She developed acute allograft rejection requiring pulse steroid and ATG. 1 month later her renal functions were within normal range. The patient continued to do well on her immunosuppression.

Two years after her kidney transplantation, she presented to the pulmonologist with gradual worsening of exertional dyspnea. A series of investigations were done including xrays , lung function tests , CT scans , v-q scan and final diagnosis of recurrent pulmonary embolism was made. Pulmonary angiogram was not attempted considering single precious kidney of the patient. The V-Q san revealed small subsegmental perfusion defect in the left upper lobe. Patient remained on anticoagulants like heparin in the earlier course and then warfarin without any resolution of her symptoms.

A trans thoracic echocardiogram revealed PAP 45 mm of Hg comparing with the previous echo 4 years ago where PAP was normal. A doppler study of her fistula revealed a very high flow rate of 1,750 ml/minute, Figure 1. An immediate closure of the fistula was advised but patient refused. She was started on endothelial

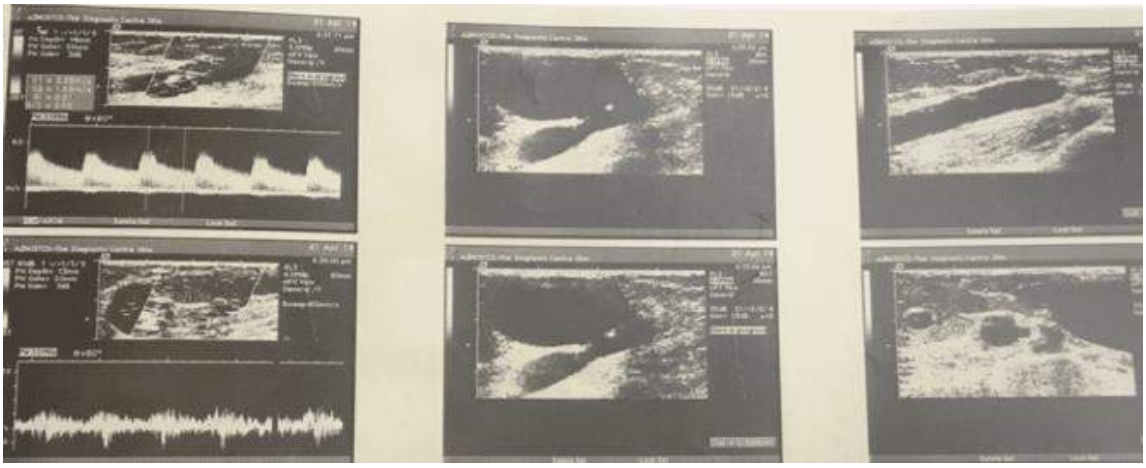

Figure 1: Arteriovenous fistula showing distended fistula vein and doppler graph of artery and vein.

receptor antagonist, calcium channel blocker and diuretics. Long term oxygen therapy (LTOT) was also added in the regime because of development of hypoxia with persistent exertional dyspnea.

For the next three years from 2014-2017, patient continued on prescribed medications with failure to alleviate her symptoms. She continued to have NYHA Class 4 dyspnea making her activities of daily living severely compromised. She underwent annual trans thoracic echo-cardiography indicating an incline in her pulmonary artery pressure, worsening of tricuspid regurgitation and development of mitral regurgitation, Figure 2, Table 1. The left atrial volume and pulmonary capillary wedge pressure remained consistently

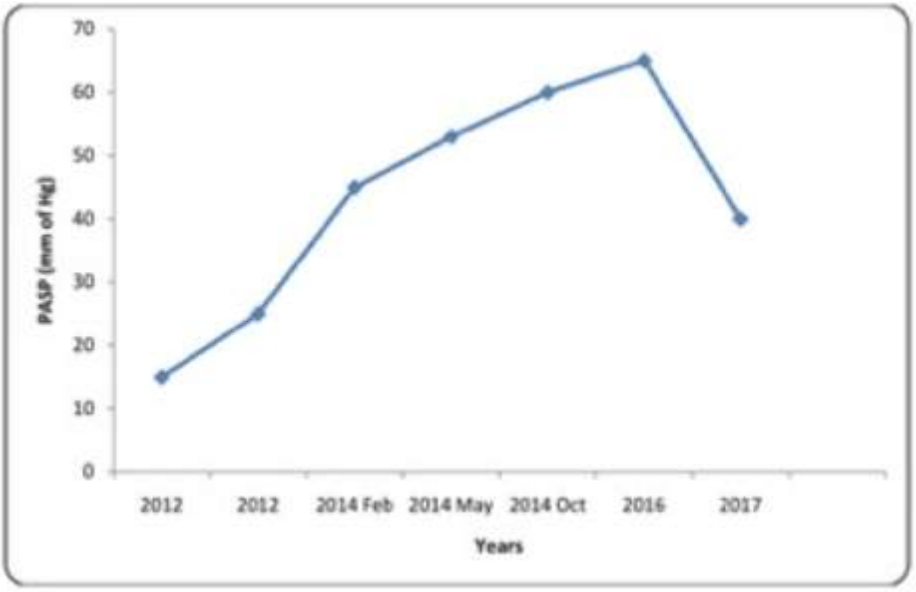

Figure 2: Changes in pulmonary arterial pressure over seven years.

Year	PASP (<30)	MR	PCWP (<12)	TR	LA Volume (19-40 mm Hg)
2010	Normal	-Ve	<12	-Ve	-
2012	Normal	-Ve	<12	-Ve	-
2014 Feb	45	Mild	18	Mild	38
2014 May	53	+	18	Moderate	49
2014 Oct	60	++	19	Moderate	56
2016	65	Moderate	16	Moderate	64
2017 3 month post AVF closure	40	Trace	14	+	35

Table 1: Echocardiographic findings over the span of five years showing changes in cardiac parameters before and after the arteriovenous fistula closure surgery.

high. She had a mild to moderate concentric hypertrophy of left ventricle with grade one diastolic dysfunction on all scans Figure 3.

The right ventricle initially was found to be of normal size and diameter gradually became enlarged and became full size by end of third year. A second doppler scan of A-V fistula planned in 2017 revealed the flow to have further increased to an average of 2885/ml/min with PAP found to be 65 on echocardiograph around same time. After multiple counseling of the patient, closure of the fistula was planned.

AVF closure surgery was performed in October 2017 where the communication between artery and vein was closed. Patient did well post operatively with minor complications like low grade fever, wound swelling and delayed healing requiring a ten days course of intravenous antibiotics. Three months after her surgery she reported major recovery in her symptoms. A fresh echocardiography was showed a PAP to be 40 mm of Hg (from 60 mm of Hg). The tricuspid regurgitation was completely gone and the mitral regurgitation was also trace. The right atrial volume had decreased, the PCWP also went down to normal upper limit. The function

Figure 3: Echocardiography from A: 2104 and B: 3 months post closure of AVF in 2017, showing improvement in the measurements of the dilated chambers.

of right ventricle also improved as well. LTOT was stopped as well as rest of the medications which patient continued for her concerned symptoms for the last three years. At one and half years of follow-up patient is not dyspneic and her daily activities and physical endurance has improved dramatically.

Discussion:

Arteriovenous fistula is the lifeline for dialysis patients. Fistula first is the desired strategy for CKD 5 patients to initiate hemodialysis rather than a temporary catheter. Dialysis patients undergoing renal transplantation invariably get their vascular access closed or it clots itself over time. [4] At the same time it may be difficult for the patient to comprehend that fistula can occasionally lead to pulmonary hypertension

due to flow and needs closure. The fear of rejection may let the patients to keep their fistula indefinitely. One of our patient still has a functioning avf of around 35 years along with a functioning renal allograft.

High output cardiac decompensation is well known in hemodialysis patients who are being dialyzed through AVF.[5] The increase load on the right heart leads to gradual decline in ejection fraction. Mean flow in the AVF may be upto 2.2L per minute, however, this can become more significant in a patient having underlying cardiac disease and a lower rate may be enough to cause symptoms. [6] The site of fistula creation is important as upper arm fistulas have a higher flow compared to radiocephalic fistulas, 1.58 vs 0.948 L/min. [7,8]

Our patient had an upper arm brachio-chephalic arteriovenous fistula with documented high blood flow. CKD 5 patients may develop pulmonary hypertension of multifactorial origin other than in relation to high AVF flow, classified in group 5 of pulmonary hypertension classification.[9] These patients may also have cardiac disease including congestive heart failure as a common scenario leading to pulmonary hypertension. Our patient had been thoroughly evaluated by cardiologist prior to transplant and was found to be free of any active cardiac disease. The worsening of pulmonary hypertension overtime and high flow in AVF was the diagnostic features in our patient. Unfortunately her refusal to close AVF led to her discomfort for next three years before AVF was closed.

Studies have shown significant improvement in cardiac output, cardiac chamber diameters once the fistula is closed.[10] Other techniques in patients requiring maintenance hemodialysis require switching to peritoneal dialysis in severe CHF, tunneled permanent catheter or placement of PTFE graft are the options. [11,12]Since our patient had a functioning renal allograft the AVF was closed with improvement in her pulmonary hypertension and discontinuation of many medications.

Conclusion:

Patients with CKD or kidney transplant presenting with unexplained or worsening pulmonary hypertension may benefit from closure of arteriovenous fistula causing high flow output failure.

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