

# Central Venous Stenosis in a Patient on Maintenance Hemodialysis: A Case Report

Latif TB<sup>a</sup>, Mohammad J<sup>b</sup>

### Abstract

*A 57-year-old male patient of chronic kidney disease on maintenance hemodialysis via right radio-cephalic fistula presented with swelling of his right arm and right half of face and headache. With the clinical suspicion of central venous obstruction he underwent venogram of right upper limb. A stenosis was found in right brachiocephalic vein. He underwent a percutaneous transluminal balloon angioplasty and his symptoms improved substantially.*

**Key words:** Arterio-venous fistula, brachiocephalic vein stenosis, central vein obstruction, hemodialysis.

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### Introduction

Central venous stenosis is common in patients who are on hemodialysis. They occur in the setting of central vein cannulation for emergency dialysis for end stage kidney disease patients. It should be suspected from clinical features in patients who are undergoing hemodialysis. It threatens functioning of arterio-venous access and hence dialysis adequacy. Here, we report a typical case.

### Case Report

A 57-year-old male on maintenance hemodialysis (three times a week via right forearm arterio-venous fistula) presented on 29<sup>th</sup> of July 2018 at renal outpatient department with the complaints of headache, swelling of his right arm and face (specially the right half) for 1 month. He had no respiratory distress and achieved dry weight (68 kg) after each dialysis, had no ankle swelling even in between two dialysis sessions. His wife mentioned that the swelling of right arm and face stayed the same even after a good hemodialysis.

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### Author Information

- a. Dr. Tanveer Bin Latif, MBBS, MRCP (UK), Consultant Nephrologist, United Hospital Limited, Dhaka, Bangladesh.
- b. Dr. Jan Mohammad, MBBS, MPhil, MD, Consultant Radiologist, United Hospital Limited, Dhaka, Bangladesh.

**Address of correspondence:** Dr. Tanveer Bin Latif, MBBS, MRCP (UK) Consultant Nephrologist, United Hospital Limited, Plot 15, Road 71, Gulshan, Dhaka-1212, Bangladesh. Email: tanveer.latif@uhlbd.com

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His old notes from hospital electronic medical record revealed that he had an episode of acute kidney injury (on chronic kidney disease from diabetic nephropathy) about a year ago which required urgent dialysis via a temporary bi-lumen right sided internal jugular catheterization. It stayed in situ for about a month and was removed thereafter. He was observed for 5 weeks but it was decided that he had to be on permanent renal replacement therapy. This time a second bi-lumen non-tunneled dialysis catheter was introduced again on the right internal jugular vein. A radio-cephalic arterio-venous fistula (AVF) was also created on the right side after doing a Doppler venous mapping on 29<sup>th</sup> August 2017. The AVF matured over next 6 weeks and dialysis was initiated via that route. As fistula could be used with good blood flow the temporary dialysis catheter was removed. There was no episode of catheter dysfunction or sepsis of any kind while the dialysis catheters were in situ. It was never converted to tunneled catheter for more prolonged duration of use.

On presentation, he was examined (immediately after a full session of dialysis on 29<sup>th</sup> July 2018) and was noted to have a markedly swollen right upper limb with swelling of the face more prominent on the right side (Figure 1).



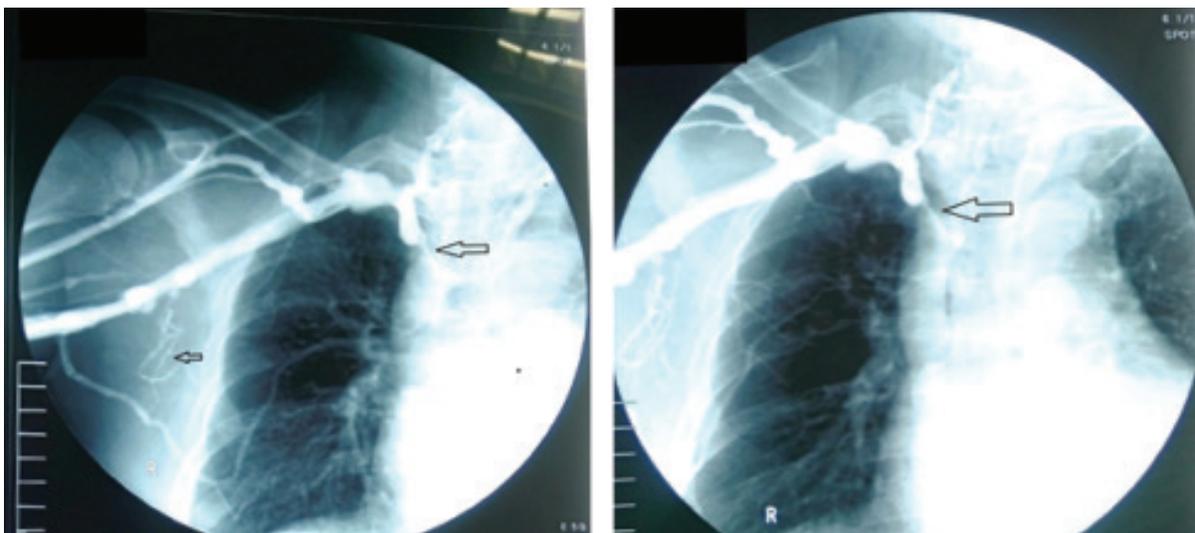
**Figure 1** Swollen right upper limb and right half of the face

He was fully conscious and oriented with immediate post-dialysis weight of 67.6 kg (dry weight achieved). Pulse rate was 78 per minute and BP 140/90 mm Hg. He was normal neurologically with no cranial nerve dysfunction. Other systems were normal.

The radio-cephalic AVF (right forearm) was examined thoroughly. It had both systolic and diastolic bruit with good thrills. The notes from dialysis unit showed that it could withstand a blood flow pump speed of around 250 ml/min with 16G needle as standard with no excessive bleeding after needle withdrawal.

We calculated his urea reduction ratio (URR) as a measure of his hemodialysis adequacy to be 71% (adequate). Laboratory values (pre-dialytic) were: hemoglobin 12 mg/dl, Hct 35%, MCV 89.9, platelet adequate, creatinine 9.07 mg/dl, sodium 131 mmol/L, potassium 5.04 mmol/L, chloride 98 mmol/L, bicarbonate 17 mmol/L.

From the history and clinical examination, a central venous obstruction (CVO) was suspected. A right upper limb venogram was arranged as this would show the exact location of stenosis if present. After a dialysis session a venous dialysis needle was kept in-situ inserted into right cephalic vein with the intention of contrast introduction. He was shifted to the radiology unit and 50 ml of radio-contrast material (non-ionic iso-osmolar iodinated) was introduced through dialysis needle to produce a venographic image under fluoroscope (Figure 2). It was reported as '80% stenosis of right brachio-cephalic (innominate) vein'.



**Figure 2** Fluoroscopic image of right upper limb venogram: large arrow = stenosis; small arrow = collaterals

He was referred to a vascular surgeon who did a percutaneous trans-luminal balloon angioplasty without any stent placement across the lesion on 19<sup>th</sup> August 2018. The swelling subsided to a great degree after the procedure and the patient is currently undergoing hemodialysis uneventfully.

### Discussion

The risk factors for the development of CVO are central vein cannulation for hemodialysis access, peripherally inserted central catheter and pacemaker wire.<sup>1</sup> It is related to the site of insertion, number, type and duration of catheter use and occurrences of catheter related infection.<sup>2</sup>

CVO develops in 40% of the patients with subclavian vein catheterization, compared with only 10% of patients with internal jugular vein catheterization (our patient had to undergo internal jugular catheterization twice). Due to this high complication rate, sub-clavian route is usually avoided in chronic kidney disease patients.

CVO is usually asymptomatic and hence the exact prevalence is uncertain. It manifests when blood flow through maturing dialysis access increases; leading to venous engorgement causing edema of ipsilateral limb, face, breast and occasionally papilledema, central venous hypertension, raised intracranial hypertension.<sup>3</sup> Venous hypertension can lead to ulceration and tissue loss of involved extremity. Swelling may cause AVF needling difficulties with the risk of bleeding, hematoma and infection thus jeopardizing its future. Bilateral central vein stenosis or superior vena cava stenosis can produce a clinical picture of superior vena cava syndrome.<sup>4</sup>

Possible pathophysiology for the development of CVO include catheter-induced initial vessel trauma, foreign body in the vein, sliding movement of the catheter with

respiration or postural or head movement and turbulence following AVF creation. Increased flow across a mature fistula travel through brachiocephalic vein to superior vena cava to right atrium. This venous drainage obstruction causes development of collaterals around shoulder and the upper chest as in our patient (Figure 2). Collaterals might partially allow mitigation of symptom and might allow the use of AVF.

As duplex ultrasound is unable to visualize the brachiocephalic vein or proximal third of subclavian vein, contrast venography remains the gold standard for diagnosis of CVO as was the case in our patient. MR angiography would also be of value.

Due to relative invasiveness of central vein surgery endovascular intervention (percutaneous trans-luminal angioplasty with or without stent placement) is the treatment of choice in most patients.<sup>5</sup> It restores functionality at least temporarily. Several studies of patients treated alone shows primary patency of < 10% at 1 year but stent replacement did improve it to 56% or more. Surgical correction of CVO is needed in only a few.

**Conflict of interest:** Nothing to declare.

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