
CASE REPORT

Killing Two Birds with One Stone: Subclavian Vein Bypass Graft for Relief of Venous Obstruction and Haemodialysis Access

Kar Wee Koh, *MBBS, Jendana Chanyaputhipong, MRCS (Edin), MB MCh BAO (Ireland), Seck Guan Tan, FRCS (Glasgow), FAMS*
Department of General Surgery, Singapore General Hospital, Singapore

ABSTRACT

Subclavian and brachio-cephalic vein stenosis or occlusion occurs, most commonly, as an iatrogenic complication of the placement of central venous catheter. This occurrence can cause ipsilateral arm swelling in a newly-created arteriovenous fistula (AVF). Critical central vein stenoses are often successfully managed by endovascular approach; occasionally, complete occlusion with symptomatic severe arm swelling and pain that does not respond to angioplasty requires ligation of the dialysis access. We report successful surgical management of an end-stage-renal-failure (ESRF) patient with symptomatic subclavian vein occlusion refractory to angioplasty in an ipsilateral arm with an existing functional brachio-basilic transposition arteriovenous fistula by performing a basilic to internal jugular vein (IJV) bypass graft, relieving both the arm swelling and salvaging the existing vascular access for future haemodialysis.

Keywords: Arteriovenous fistula, Bypass, Central vein stenosis, Graft, Haemodialysis

INTRODUCTION

Instrumentation like central venous catheter placement for dialysis in end-stage-renal-failure (ESRF) patients while awaiting maturation of arteriovenous fistula (AVF), often leads to iatrogenic complications such as subclavian and brachio-cephalic vein stenosis or occlusion, resulting in ipsilateral arm swelling in a newly-created AVF. Critical central vein stenoses can often be treated using an endovascular approach; occasionally, complete occlusion with symptomatic severe arm swelling and pain that does not respond to angioplasty requires ligation of the dialysis access. We report the successful surgical management of an ESRF patient with symptomatic subclavian vein occlusion refractory to angioplasty in an ipsilateral arm with an existing functional brachio-basilic transposition arteriovenous fistula by performing a basilic to internal jugular vein (IJV) bypass graft, relieving both the arm swelling and salvaging the existing vascular access for future haemodialysis.

CASE REPORT

Mr LSF, a 52-year-old Chinese male with hypertension and ESRF secondary to IgA nephropathy received a cadaveric kidney transplant in 2007. The initial right radial-cephalic AVF was subsequently ligated. In late October 2009, with failing renal allograft, he was admitted for fluid overload. A temporary right-sided permcath was inserted into the right internal jugular vein for haemodialysis. At the time, bilateral iliac and central venogram performed via right common femoral vein puncture prior to permcath insertion showed bilateral patent subclavian and brachiocephalic veins and superior vena cava. He was then referred for new vascular access creation.

In January 2010, he underwent elective right brachio-basilic transposition (BBT) AVF creation. Intraoperatively, he was noted to have dilated veins on his right shoulder, indicating possible central vein stenosis. However, the decision was made to proceed and deal with the central vein stenosis



Fig. 1. Picture of swollen right arm post-multiple angioplasties but pre-bypass surgery

postoperatively. Change of central venous catheter to the left and angiogram and angioplasty of what was thought to be a right subclavian vein critical stenosis was performed the following day, with satisfactory outcome (<30% residual stenosis).

Unfortunately, he represented within two weeks post-angioplasty with worsening, severe and debilitating right arm swelling and pain (fig. 1). Central venogram via the right basilic arterialised vein revealed long-segment total occlusion of the right subclavian vein (fig. 2) with multiple large collaterals; multiple attempts at angioplasty proved unsuccessful. Subsequent duplex scan confirmed patent right IJV, thus, a decision was made to bypass the obstruction for symptomatic relief while preserving the functioning brachial AVF.

A right basilic vein to internal jugular vein bypass graft was performed with four separate incisions over the right basilic vein, deltoid, right posterior triangle of the neck and over the anterior margin of the right sternomastoid muscle. A 6 mm flixene graft (Atrium) was used. After an end-to-side anastomosis to the right internal jugular vein was

performed, the graft was tunnelled lateral to the deltoid muscle and completed with an end-to-side anastomosis to the transposed right basilic vein (fig. 3).

Postoperatively, the patient recovered well with resolution of right arm swelling and pain (fig. 4). His existing bypass cum haemodialysis graft was functional with haemodialysis done three times without problem in February 2010. However, there was stenosis at the graft and AVF site in July 2011 and he had a successful angioplasty. There was recurrent high grade stenosis in the graft in September 2011 and he had another angioplasty successfully. The graft remained patent as of 5th April 2012.

DISCUSSION

Central venous catheterisation is an essential bridge in providing temporary haemodialysis for ESRF patients whose arteriovenous access is not ready for use. A complex pathophysiology of foreign body reaction in an uremic milieu results in consequent inflammation of the vessel wall. Turbulent flow during haemodialysis exerts its effect on the vascular biology of the vein wall. This is

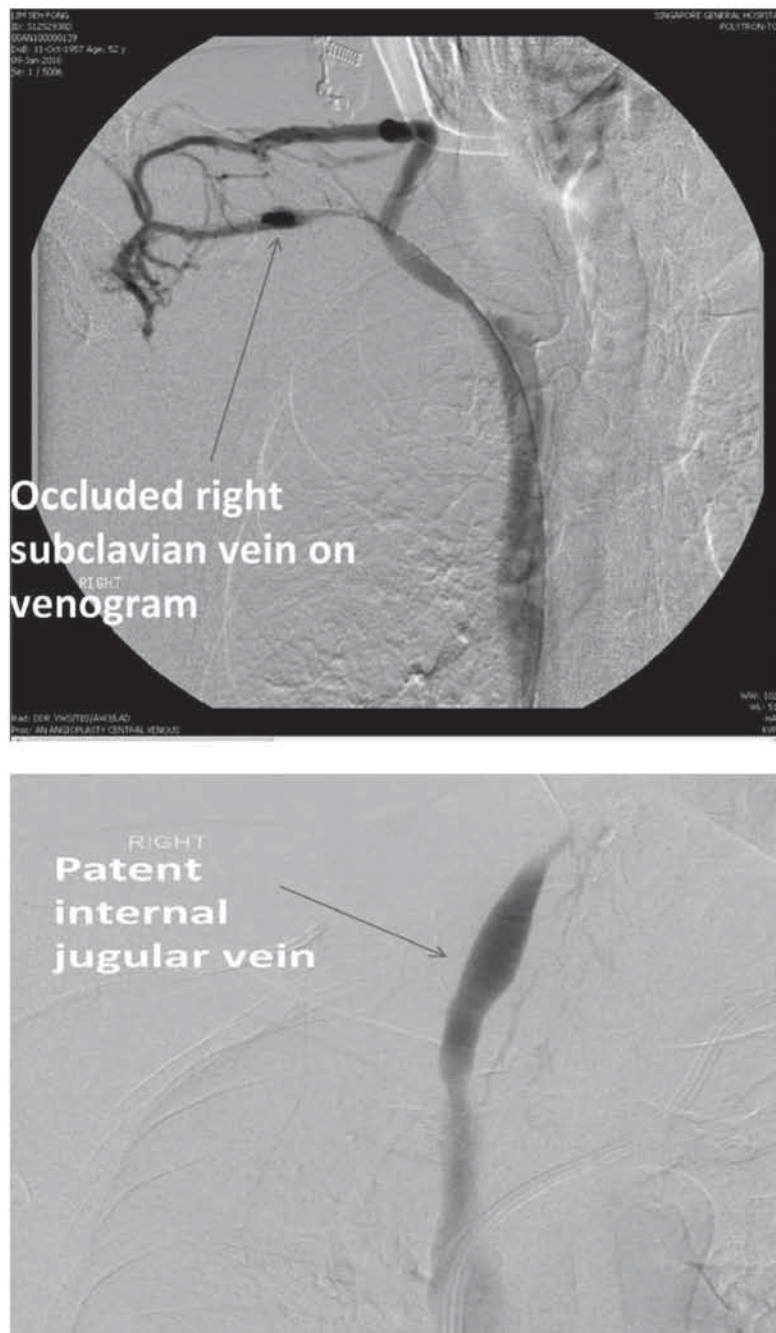


Fig. 2. Venogram showing occluded subclavian venogram despite angioplasty

compounded by the direct physical damage caused by the catheter, leading to stenosis^{1,2}. Prolonged catheterisation and higher number of previous catheter insertions are associated with increased incidence of central venous stenosis^{1,3}. Incidence of subclavian vein stenosis is approximately 30–50 % with catheters (not just dialysis catheters) placed into the subclavian vein³⁻⁵. Internal jugular catheters are a better option with lower risk of

stenosis compared to subclavian catheters⁶ and very rarely cause subclavian stenosis. However, in this case, a right internal jugular line was inserted but the right subclavian was stenosed while the right internal jugular vein was patent (fig 2).

Our patient was scheduled for an elective right BBT AVF creation after a central venogram done two months prior to the date of surgery showed

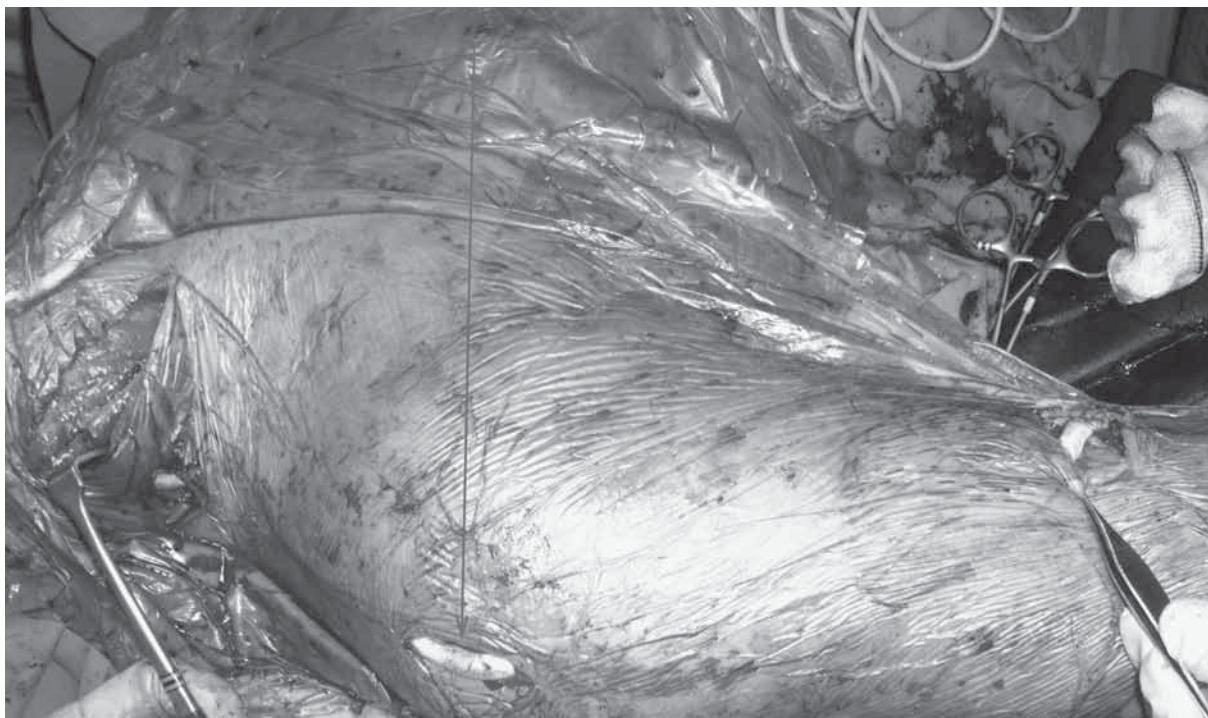


Fig. 3. Intra-op picture showing basilica to internal jugular vein bypass graft



Fig. 4. Post-operation follow-up showing marked reduction in right arm swelling

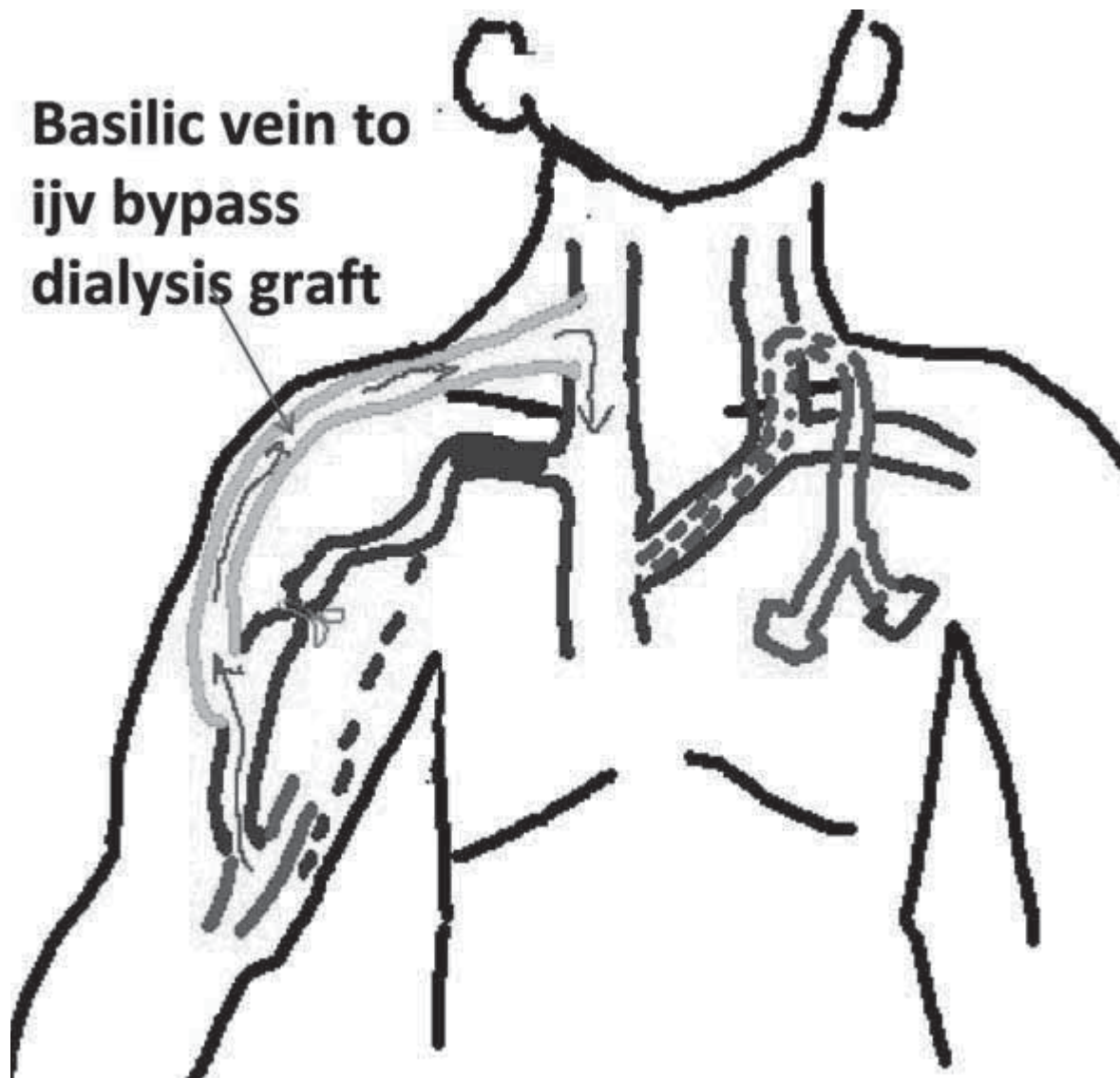


Fig. 5. Diagram to illustrate graft redirecting flow from right basilic vein to internal jugular vein, bypassing the stenosed subclavian vein

presence of patent central veins bilaterally. In view of the dilated veins found on his right shoulder after induction, we proceeded with surgery first and had the permcath replaced on the left side the following day post-surgery. A central venogram was done at the same time and angioplasty performed on what was thought to be the right subclavian vein. His arm swelling continued to get worse, which led to his representation two weeks after angioplasty. When a repeat central venogram was performed, it was discovered that his right subclavian vein was completely occluded and that the initial angioplasty performed was to a collateral vein, not the right subclavian vein itself. Multiple attempts at angioplasty to the occluded right subclavian vein proved unsuccessful. In view of the presence of patent right IJV demonstrated on duplex scan, the surgical option of BBT to IJV

bypass was decided for the patient (fig 5).

In the 'Fistula First' era, central venous stenosis with resultant venous hypertension is a 'threat' to the maturity and function of the ipsilateral arm dialysis fistula. Endovascular treatment of central vein stenosis with angioplasty is first line in the management of central venous stenosis⁷. Initial success rates with angioplasty have been good at 89% and the complication rate has been very low⁸⁻¹⁰. The reason for failure of angioplasty is not clear, but could very well be factors such as residual stenosis, elasticity of the lesion, or even a failure to diagnose arterial inflow lesions. Those that recur quickly within a three-month period post-angioplasty or show significant residual stenosis (greater than 50%) due to acute elastic recoil of the vein after angioplasty are indications

for stent placement^{7,11-15}. Surveillance and repeated intervention is necessary to maintain patency^{16,17}.

Surgical bypass is indicated when angioplasty fails^{18,19-22}. Various successful upper extremity venous bypass has been described: brachio-jugular, jugular-jugular, brachio-contralateral jugular²³, axillary-jugular²⁴, axillary-axillary²⁵ and even axillary-right atrial bypass²⁶ in providing both symptomatic relief and salvage of a functioning dialysis access.

In this report, we share our experience with brachio-internal jugular vein bypass in a patient with subclavian vein occlusion and functioning ipsilateral brachio-basilic transposed fistula, whose bypass itself doubled as an access conduit. Thus, 'killing two birds with one stone'.

CONCLUSION

Access surgeons should be alert to recognise opportunities to salvage access options as in this patient where surgical bypass to the internal jugular vein relieved the debilitating symptoms of venous hypertension secondary to subclavian vein stenosis refractory to angioplasty while preserving the existing ipsilateral functioning dialysis access at the same time.

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