

## Transposition of cephalic vein to rescue hemodialysis access arteriovenous fistula and treat symptomatic central venous obstruction

### *Transposição de veia cefálica para salvamento de fístula arteriovenosa de hemodiálise e tratamento de obstrução venosa central sintomática*

Felipe Jose Skupien<sup>1</sup>, Ricardo Zanetti Gomes<sup>1</sup>, Emerson Hideyoshi Shimada<sup>1</sup>,  
Rafael Inacio Brandao<sup>1</sup>, Suellen Vienscoski Skupien<sup>2</sup>

#### Abstract

It is known that stenosis or central venous obstruction affects 20 to 50% of patients who undergo placement of catheters in central veins. For patients who are given hemodialysis via upper limbs, this problem causes debilitating symptoms and increases the risk of loss of hemodialysis access. We report an atypical case of treatment of a dialysis patient with multiple comorbidities, severe swelling and pain in the right upper limb (RUL), few alternative sites for hemodialysis vascular access, a functioning brachio basilic fistula in the RUL and severe venous hypertension in the same limb, secondary to central vein occlusion of the internal jugular vein and right brachiocephalic trunk. The alternative surgical treatment chosen was to transpose the RUL cephalic vein, forming a venous necklace at the anterior cervical region, bypassing the site of venous occlusion. In order to achieve this, we dissected the cephalic vein in the right arm to its junction with the axillary vein, devalved the cephalic vein and anastomosed it to the contralateral external jugular vein, providing venous drainage to the RUL, alleviating symptoms of venous hypertension and preserving function of the brachio basilic fistula.

**Keywords:** arteriovenous fistula; central venous obstruction; venous transposition; exotic vein graft; venous bypass.

#### Resumo

Sabemos que estenose ou obstrução venosa central ocorre em 20 a 50% dos pacientes que são submetidos à colocação de cateter em veias centrais. Nos pacientes que realizam hemodiálise pelos membros superiores, este problema causa sintomas debilitantes e um grande risco de perda do acesso para hemodiálise. Relatamos um caso atípico de tratamento em um paciente dialítico com múltiplas comorbidades, queixa de dor e edema severo do membro superior direito (MSD), escassas alternativas de acessos vasculares para hemodiálise e fístula braquiobasilíca funcionante do MSD associada à severa hipertensão venosa deste membro, secundária à oclusão venosa central da veia jugular interna e do tronco braquiocéfálico direito. O tratamento cirúrgico alternativo foi a transposição da veia cefálica do MSD, formando colar venoso na região cervical anterior, resultando em um *bypass* sobre o sítio venoso ocluído. Para isso, realizamos a dissecação da veia cefálica no braço direito até a sua junção com a veia axilar, devalvulamos e anastomosamos a veia cefálica na veia jugular externa contralateral, permitindo a drenagem venosa do MSD, aliviando os sintomas da hipertensão venosa e mantendo a fístula braquiobasilíca funcionante.

**Palavras-chave:** fístula arteriovenosa; obstrução venosa central; transposição venosa; enxerto venoso exótico; *bypass* venoso.

<sup>1</sup> Santa Casa de Misericórdia de Ponta Grossa – Ponta Grossa, PR, Brazil.

<sup>2</sup> Universidade Estadual de Ponta Grossa – UEPG, Ponta Grossa, PR, Brazil.

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## ■ OBJECTIVE

To describe an atypical case in which vascular access for hemodialysis was preserved and central venous obstruction treated.

## ■ METHOD

A patient with few remaining options for vascular access presented with a functioning brachio basilic fistula in the right upper limb (RUL), associated with severe venous hypertension, and occlusion of the internal jugular vein and the right brachiocephalic trunk.

We decided to transpose the RUL cephalic vein, forming a venous necklace in the anterior cervical region, bypassing the site of venous occlusion.

In order to achieve this, we dissected the cephalic vein in the right arm to its junction with the axillary vein, devalved the cephalic vein and anastomosed it to the contralateral external jugular vein, providing venous drainage to the RUL, alleviating symptoms of venous hypertension and preserving function of the brachio basilic fistula.

## ■ RESULT

Reduction of edema, pain and venous congestion in the RUL, in addition to preservation of an arteriovenous fistula (AVF) that was already mature and functioning.

## ■ DISCUSSION

Stenosis or central venous obstruction affects 20 to 50% of patients who undergo placement of catheters in the subclavian or internal jugular vein.<sup>1,2</sup> Many of these patients can remain symptomless for long periods because of the rich network of collateral veins to maintain venous drainage from the upper limb. In patients with functioning arteriovenous fistulae, this can lead to venous hypertension, edema of the limb and failure of vascular access.<sup>3</sup>

Percutaneous angioplasty, with or without placement of stents or other endovascular devices (HeRO, for example),<sup>4,5</sup> has been evolving and is becoming ever more common, taking its place in the arsenal of options for treating such patients.

The simpler treatment options include rest and elevation and elastic compression of the limb, or deactivation of the AVF (although this option involves sacrificing the access and subjects patients to further central catheterization until the next AVF matures).

The following surgical options are described in isolated case reports and case series

- Bypass of an occluded subclavian (with prosthesis) to the ipsilateral internal jugular, contralateral internal jugular, axillo-axillary;<sup>1,6</sup>
- Axillo-axillary, brachial-internal jugular, axillary-ipsilateral or contralateral internal jugular bypass; bypass of fistula to jugular vein, of fistula to contralateral subclavian;<sup>1,7-10</sup>
- Bypass to veins of the lower limbs (axillo-iliac, axillo-popliteal, axillo-femoral, axillo-saphenous);<sup>9,11</sup>
- Bypass with interposition of the contralateral internal jugular vein<sup>12,13</sup> or transposition of the ipsilateral jugular vein to the occluded segment;<sup>10,14</sup>
- Bypass to the right atrial appendage<sup>15,16</sup> and to the innominate vein;<sup>17</sup>
- Banding of the access to control fistula flow;<sup>18</sup>
- Arteriovenous axillary loop graft;<sup>19</sup>
- Anterior jugular-internal jugular bypass.<sup>20</sup>

Some authors consider that many stenoses or occlusions become symptomatic in dialysis patients because of extrinsic compression and recommend that in such cases Thoracic Outlet Syndrome should be considered.<sup>21</sup> In some case series, surgical treatment with resection of the first rib or of the clavicle, and liberation of external adhesences to the subclavian vein salvaged access and relieved symptoms in up to 80% of patients.<sup>22</sup>

The patient described here had a brachio basilic AVF in the RUL that had been functioning for approximately 6 months; but edema and pain prompted a request for additional vascular assessment.

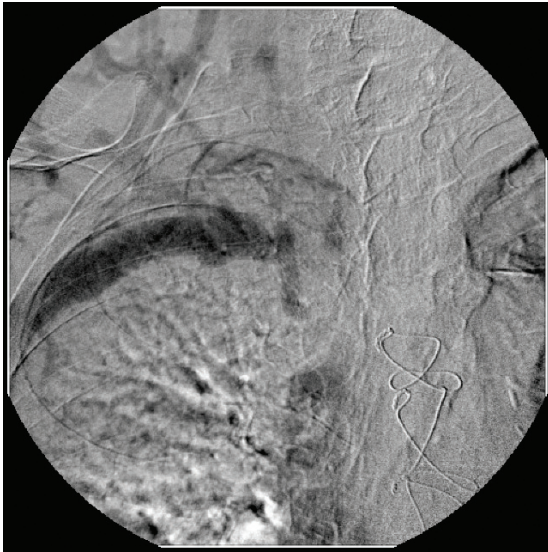
Native accesses were exhausted in the left upper limb (LUL) and the right forearm and the left lower limb had been subjected to prior saphenectomy for myocardial revascularization, and both lower limbs had venous insufficiency (CEAP C 4). The patient also had histories of ischemic claudication in lower limbs, diabetes, hypertension, prior smoking habit and myocardial infarction.

Investigation included Doppler venous ultrasound, angiotomography of the thorax and phlebography, which confirmed occlusion of the internal jugular vein and right brachiocephalic trunk (Figures 1 and 2).

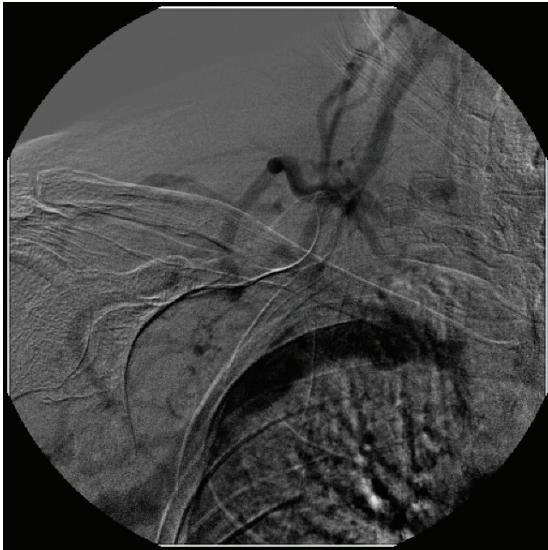
Venous Doppler ultrasound of the RUL showed a mature brachio basilic AVF and a cephalic vein that was patent in the arm up to its junction with the axillary vein, from where onwards it exhibited pulsating reverse flow— due to retrograde transmission from the axillary vein (Figure 3).

Conservative treatment comprised elevation of the limb, use of binding and elastic armbands, but there was no significant improvement in symptoms.

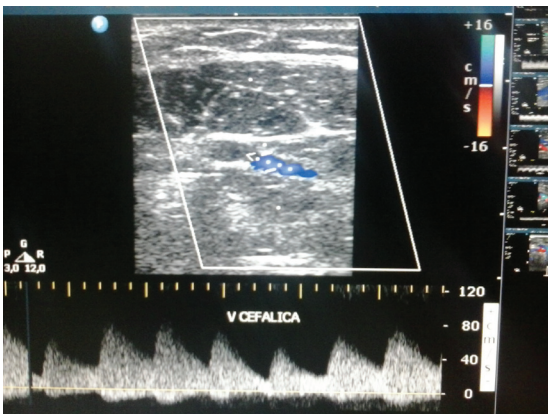
We recommended endovascular intervention. However, this would have entailed transferring the



**Figure 1.** Occlusion of right brachiocephalic trunk.



**Figure 2.** Occlusion of internal jugular vein and right brachiocephalic trunk, and rich network of collateral veins.



**Figure 3.** Doppler ultrasound showing right cephalic vein with reversed, pulsating flow.



**Figure 4.** Right upper limb twelve months after surgery.

patient to a different city and both the patient and her family members refused.

We therefore chose an option designed to preserve AVF function while reducing venous hypertension in the RUL. To achieve this, under local anesthetic (brachial plexus block) we dissected the cephalic vein (patent in the distal third of the arm) up to its junction with the axillary vein. Using a Mills valvulotome, we achieved pulsating flow in the entire cephalic vein.

Under supplementary local anesthetic to the anterior cervical region, we dissected the left external jugular vein, tunneled the devalved right cephalic vein and created a terminal-lateral anastomosis with the left external jugular vein.

At the end of surgery, we observed a thrill in the transposed cephalic vein neck and also at the brachiocephalic AVF.

The procedure was accomplished without intercurrent conditions and, after surgery, the patient continued her normal hemodialysis program, using the same access as prior to surgery (basilic vein of right arm) and her right upper limb edema gradually receded (Figure 4).

More than thirteen months after surgery, the fistula was still functioning, the patient was on hemodialysis three times a week and had no further complaints caused by venous hypertension of her right upper limb.

## CONCLUSIONS

Our case bears out what is to be expected from data described in the literature, including primary patency rates of around 85% after twelve months,<sup>3</sup> mean duration of access function of 9 months and 88% of cases with improvement in symptoms.<sup>23</sup>

Although rare, like other exotic grafts described in the literature, the treatment described here is an effective option for preserving dialysis vascular access in patients with central venous occlusion.



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### Correspondence

Felipe Jose Skupien  
Felipe Jose Skupien  
Rua Santana, 200 - Centro  
CEP 84010-320 - Ponta Grossa (PR), Brasil  
Fone: (42) 3028-0033 Fax: (42) 3028.3033  
E-mail: felipeskup@bol.com.br

### Author's information

FJS é Cirurgião Vascular da Santa Casa de Misericórdia de Ponta Grossa (SCMPG).  
RZG é Chefe do Serviço de Cirurgia Vascular da Santa Casa de Misericórdia de Ponta Grossa (SCMPG).  
EHS é Médico Residente em Cirurgia Vascular da Santa Casa de Misericórdia de Ponta Grossa (SCMPG).  
RIB é Cirurgião Vascular da Santa Casa de Misericórdia de Ponta Grossa (SCMPG).  
SVS é Docente do Departamento de Enfermagem e Saúde Pública da Universidade Estadual de Ponta Grossa (UEPG); Mestranda em Tecnologia em Saúde pela Pontifícia Universidade Católica do Paraná (PUC-PR).

### Author's contributions

Conception and design: FJS  
Analysis and interpretation: FJS  
Data collection: FJS, EHS  
Writing the article: FJS, SVS  
Critical revision of the article: FJS, RZG, EHS, RIB, SVS  
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