Case Report

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Central Venous Occlusion Caused by a Collapsed Stent: Endovascular Treatment in an Emergency

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Background: Stenosis and central venous obstruction are very serious and frequent complications in hemodialysis patients. The incidence of these complications is 30% and is due to an increase in venous flow that generates inflammation and proliferation of the endothelium. Causes of acute venous occlusion have rarely been described and the endovascular therapeutic options include percutaneous transluminal angioplasty (PTA) with or without the placement of a stent.
Methods: We report the clinical case of an acute occlusion of a covered stent in a right anonymous vein treated through a Bard Covera Plus recanalization and stent delivery procedure. We also performed a review of the scientific literature of the endovascular treatment of stenosis and occlusions of large venous vessels.
Results: The endovascular procedure has shown an excellent result of recanalization of a collapsed and acute occluded venous stent. PTA is always recommended as the first line of endovascular treatment of venous steno-occlusions. As far as we know, there are no studies with large case series describing the results analyzed in our clinical case.
Conclusions: Our experience suggests promising results of the use of the stent Covera Plus. However, it is essential to carry out safety and efficacy studies of the treatment on large series and in the long term.

Keywords: *Interventional Radiology; Interventional Nephrology; Venous Covered Stent; Phlebography; Vascular Treatment*

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BACKGROUND

Stenosis and central venous obstruction are very serious and frequent complications in hemodialysis patients. The incidence of these complications is 30% and is due to an increase in the flow and venous flow that generates inflammation and proliferation of the endothelium [1–3]. Causes of acute venous occlusion caused by stent collapse have rarely been described. We present the urgent treatment of an acute occlusion of a covered stent in a right anonymous vein through an endovascular interventional radiology procedure.

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CASE REPORT

A 57-year-old male patient was undergoing follow-up of a distal arteriovenous fistula right brachial-cephalic. About 7 months previous he developed central venous obstruction syndrome caused by severe stenosis of the anonymous right venous trunk and was subsequently treated via some percutaneous transluminal angioplasty (PTA) and covered stents. In the past 10 days, the patient had again developed worsening central venous occlusion syndrome. Interventional radiology consultancy was performed with phlebographic indication for possible endovascular treatment.

Upon physical examination, there was an increase in the size of the right arm compared with the contralateral. The presence of some aneurysms in the venipuncture sites of greater caliber than in the previous examination were observed. The cephalic vein was poorly compressible along the course and not collapsible on the Elevation Test. On palpation, the presence of pulsation was detected at the level of the surgical scar. On auscultation, there was a low systolic murmur, with low frequency and with normal intensity at the level of the surgical scar. The Eco-Color-Doppler examination

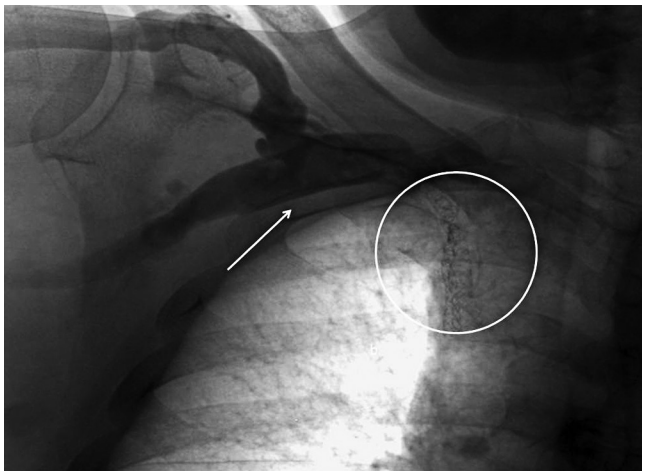

Figure 1 Upper limb phlebography (arrow) demonstrating complete occlusion and partial collapse of the stent (circle).

showed patency of the anastomotic chamber. The blood flow of the arteriovenous fistula was measured at the pre-anastomotic humeral artery with a result of 300 ml/min and with resistance indices within the limits. The post-anastomotic venous side showed regular development of the cephalic axis without narrowing. The vein was pulsating up to the outlet in the subclavian due to central stenosis.

Under local anesthesia, double access was performed at the level of the cephalic vein in the right arm and in the right common femoral vein by means of ultrasound fluoroscopic guidance. Phlebography performed through the introducer located in the right arm showed obstruction and partial collapse of the stent placed in the right anonymous vein. We had no information on the characteristics of the previously implanted stent. The stent was recanalized through combined access following the evaluation of the caliber of the venous vessel,

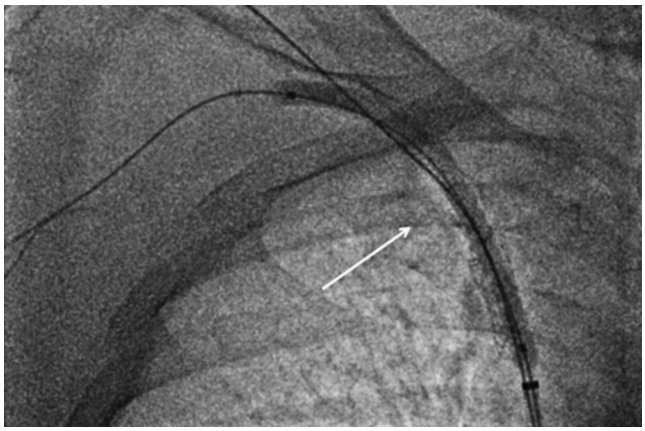

Figure 3 PTA for pre-dilation (arrow) of the occluded stent.

which was performed through the phlebographic images and based on the normal anatomy. After pre-dilation with an 8 × 80 mm Bard Ultraverse PTA catheter, the new covered stent Covera Plus 10 × 60 mm device was positioned in the lumen of the previous stent. Subsequently, further intra-stent dilation was performed through a 10 × 40 mm Bard Conquest PTA catheter. A total of 4,000 IU of intra-procedural enoxaparin sodium was administered. At the final phlebographic control, good patency of the venous lumen was found.

The patient was discharged without complications with complete re-functionalization of the arteriovenous fistula. Subsequently, double anti-aggregation was recommended (clopidogrel/acetylsalicylic acid 75/100 mg) for 3 months and then clopidogrel 75 mg for 9 months thereafter. In the following checks at 30, 60, and 90 days, complete resolution of the central venous syndrome was noted. At 12 months, there were no signs of stent occlusion. The patient is currently performing clinical instrumental follow-up and is in good physical condition.

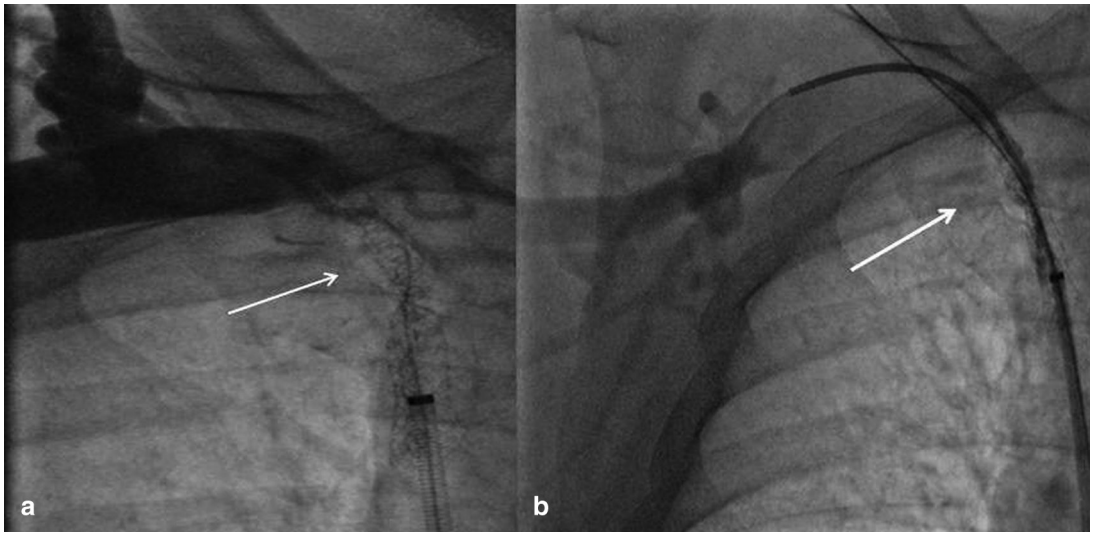

Figure 2 Recanalization (arrow) of the occlusion with phlebographic examination (**a**, **b**).

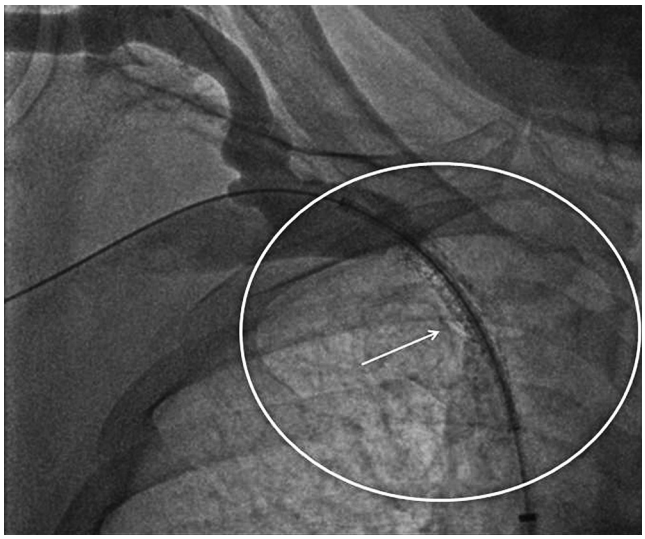

Figure 4 Localization of the new stent (circle).

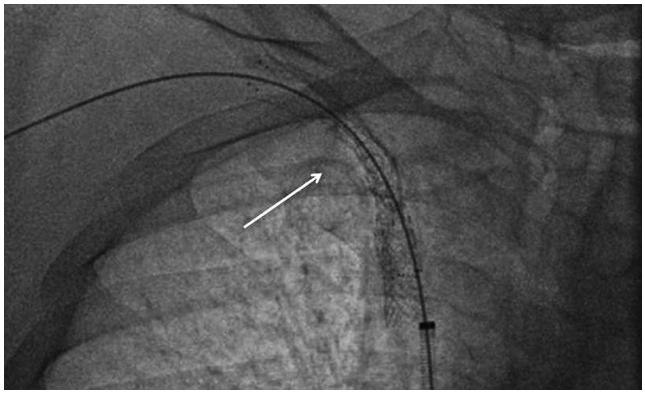

Figure 5 Release of the new stent (arrow).

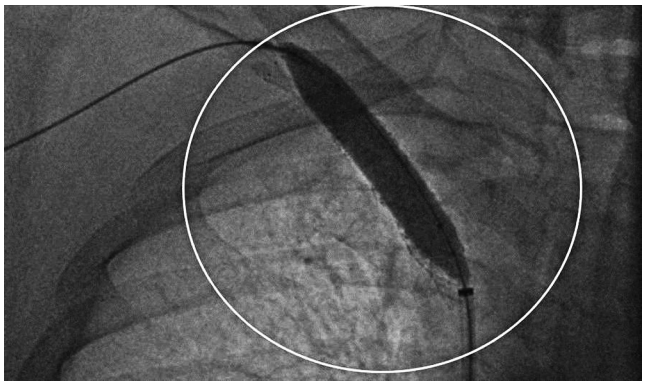

Figure 6 PTA of released stent (circle).

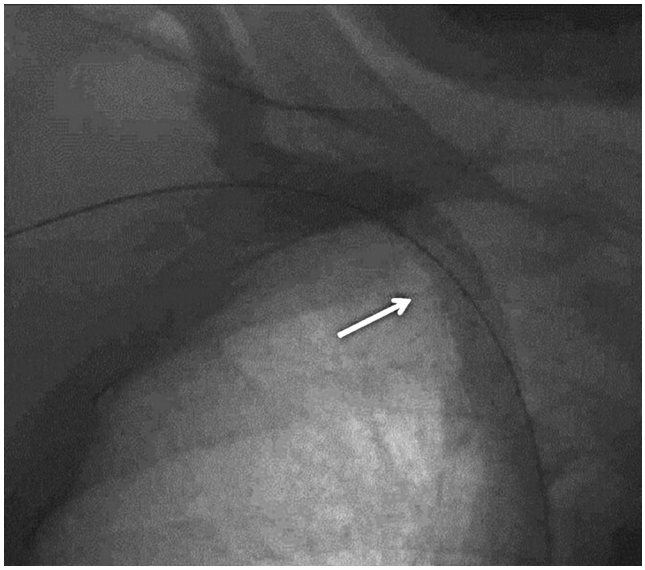

Figure 7 Phlebography demonstrating patency of the vessel (arrow).

Ethical Approval and Informed Consent

Ethical approval was not required. Informed consent was not possible due to the inability to contact the patient and the information has been anonymised.

DISCUSSION

The central venous obstruction for stent occlusion (CVD) can be asymptomatic [1,4,5]. Most occult CVDs become clinically evident after the development of a functioning arteriovenous fistula access. Symptoms of CVD depend on the site of venous stenosis or obstruction. As described in our paper, narrowing or occlusion of the central vein can lead to edema, venous hypertension, swelling, tenderness, pain, and erythema. In many cases, CVD can lead to aneurysmal dilation and tortuosity of the fistula for venous hypertension.

The development of venous collaterals that divert blood centrally are evident on physical examination of the neck, thorax, and ipsilateral extremity. Many patients present with low flow AV fistulas, and elevated venous pressure with prolonged bleeding from needle access sites after dialysis. Diagnostic imaging plays a central role in the diagnosis of acute central venous obstruction or occlusion. CVD can be diagnosed through ultrasound-detectable signs that consist of an absence of normal respiratory variation in central vein diameter and polyphasic atrial waves [3–6].

Phlebography is the gold standard for diagnosis [1,7,8] as it allows a complete evaluation of the entire vascular system [5]. In selected cases, ANGIO-RM could replace the phlebographic examination but there are still no scientific comparisons between the two imaging methods. There are many endovascular therapeutic options in use for stent venous central occlusion. These include PTA with or without the placement of an uncoated metal stent and, more recently, through the placement of covered stents. To our knowledge, there have been no randomized control studies comparing PTA and stents in hemodialysis

patients. The indication for stent implantation in previously implanted stents is recommended in conditions of acute thrombosis, collapse, and occlusion. The risks of stent implantation are related to the possibility that it may migrate, shorten, or fracture in a subacute or delayed manner after delivery [4,5,9]. The stent can cause intimal hyperplasia leading to relapsing stenosis [9]. The recommended stents are self-expanding stents. Balloon expandable stents are not routinely used as they can deform (squeeze) or migrate, especially in the subclavian and brachiocephalic veins [10]. Numerous scientific papers show a very high percentage of technical success.

As far as we know, in the literature there are no cases of the use of the stent Covera Plus in the emergency treatment of the occlusion of a central venous stent in hemodialysis patients. The advantages of the stents Covera Plus are that they are self-expanding and they form a relatively inert and stable intravascular matrix that promotes wall endothelialization and reduces the intimate hyperplastic response. The disadvantages of the stents Covera Plus are the costs and the coverage of venous collaterals.

CONCLUSION

As far as we know, there are no scientific articles in the literature describing the procedure for recanalization of acute occluded venous stents through the implantation of the stent Covera Plus. Although our experience suggests promising results, it is essential to carry out safety and efficacy studies of the treatment on large series and in the long term.

Ethics Statement

(1) All the authors mentioned in the manuscript have agreed to authorship, read and approved the manuscript, and given consent for submission and subsequent publication of the manuscript.
(2) The authors declare that they have read and abided by the JEVTM statement of ethical standards including rules of informed consent and ethical committee approval as stated in the article.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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Author Contributions

All authors contributed substantially to the study and writing of the manuscript.

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