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# Case report of a large cephalic vein aneurysm inducing heart failure in a renal transplant patient with radio-cephalic fistula for haemodialysis

Marco Panagrosso [a], Umberto Marcello Bracale [a,*], Luca del Guercio [a], Alessia Viscardi [a], Antonio Peluso [a], Ettore Dinoto [b]

[a] Department of Public Health, Vascular Surgery Unit, University Federico II of Naples, Naples, Italy
[b] Department of Surgical, Oncological and Oral Sciences, Vascular Surgery Unit, University of Palermo, Palermo, Italy

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ABSTRACT

*INTRODUCTION:* The autologous arteriovenous fistula (AVF) is considered the best vascular access for haemodialysis in patients with chronic kidney disease but in time can lead to several complications.
*PRESENTATION OF A CASE:* Herein we describe a case of a large cephalic vein aneurysm causing heart failure in a renal transplant patient being treated with radio-cephalic AVF for haemodialysis. The patient was judged to be at very high risk for potential catastrophic rupture of the aneurysm and his cardiac function was deteriorating so a surgical resection was offered. Under general anesthesia, a longitudinal incision was performed on the volar side of the forearm and the anastomotic junction was ligated. The cephalic vein aneurysm was isolated and a total resection of the vein, up to the joint of the elbow, was carried out. A specimen was also submitted for histological and immunohistochemical analysis.
*DISCUSSION:* At present no clear indications pertaining to the need to close an AVF after kidney transplantation exist. Some authors recommend a closing of the fistula in patients with stable renal function to prevent the onset of complications, while others advise never to close the asymptomatic fistula in order to preserve vascular access for haemodialysis in case of graft failure.
*CONCLUSION:* Based on our clinical experience, we suggest not ligating vascular access during the first year following transplantation with the exception of patients needing emergent closure. Otherwise, surgical closure to prevent the onset of complications could be considered a viable option in the following subset of patients: those who are 3 or more years from transplantation with good and stable renal function, those with a significant growth of venous aneurysms or have a high AVF flow rate or are young patients.


## 1. Introduction

Chronic kidney disease is increasingly recognized as a global health issue affecting 10%–15% of the world population. Despite an increase in the number of kidney transplants - the best treatment for end-stage renal disease patients - chronic haemodialysis still remains the most common therapy. The autologous arteriovenous fistula (AVF) provides the best access to circulation because of low complication rates, long-term use and lower costs compared to an arteriovenous graft and central venous catheter. Current guidelines in postoperative care of kidney transplant recipients do not give clear recommendations about management of AVF for stable kidney transplant patients [1,2].

Herein we describe the management of a large cephalic vein aneurysm causing heart failure in a renal transplant patient with a radio-cephalic AVF for haemodialisys. This research work has been reported in line with the SCARE checklist [3].

## 2. Case presentation

A 53-year-old male patient was admitted to our Nephrology Unit with a 3-month history of gradually progressive dyspnea and bilateral leg swelling. The patient noted an increasing volume in his left radio-cephalic AVF for haemodialysis access that had significantly grown in size over the past few years although he did not experience any discomfort. On examination, multiple pulsatile masses were noted along the entire forearm the largest of which was localized at the wrist and measured a maximum transverse diameter of more than 10 cm (102 mm) (Fig. 1A).

The patient had a history of hypertension and end-stage renal disease secondary to nephrotic syndrome. He required haemodial-

* Corresponding author at: Department of Public Health, Vascular Surgery Unit, University Federico II of Naples, Via Sergio Pansini 5, 80131, Naples, Italy.
*E-mail address:* umbertomarcello.bracale@unina.it (U.M. Bracale).

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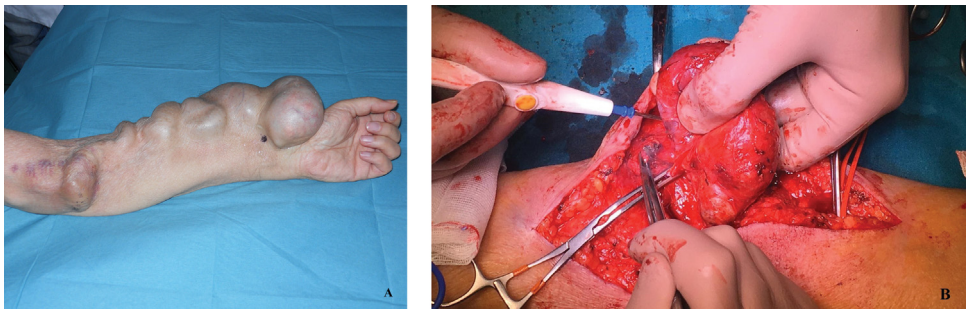

**Fig. 1.** A) Multiple giant venous aneurysms along the course of the left cephalic vein: the largest is easily observable on the wrist, where radio-cephalic fistula is located; 1B) Surgical incision and aneurysm exposure.

ysis treatment through his left-sided radio-cephalic AVF for 14 consecutive years prior to his successful kidney transplantation from a deceased donor 16 years ago. At the time of admission, the patient was still under immunosuppressive therapy with cyclosporine (400 mg/die) and corticosteroids (5 mg/die) and presented a decreased ejection fraction of approximately 30 % with a dilated left ventricle and global hypokinesis on transthoracic echocardiography. The reduction of cardiac output had also caused a renal function decrement of the graft. He denied having had any recent trauma.

A duplex scan showed an arterio-venous anastomosis between the radial artery and cephalic vein and confirmed the presence of multiple giant aneurysms of the cephalic vein. The brachial artery also appeared to be increased in size with a maximum diameter of about 24 mm with indices of resistance (0.46–0.55) which, however, can still be considered within the normal limits but the flow rate of the AVF was very high at around 11 L/min. The radial artery in the post-anastomotic tract showed a reverse flow estimated at about 210 mL/min. The post-anastomotic side of the vein appeared to be characterized by the presence of large aneurysms of the cephalic vein with considerable variations in size and the presence of parietal calcifications without intraluminal thrombotic material. The patient was judged to be at very high risk for catastrophic rupture of the large cephalic aneurysm and his cardiac function was deteriorating and so a surgical resection was offered.

A longitudinal incision was performed under general anesthesia on the volar side of the forearm and the anastomotic junction was ligated (Fig. 1B). The cephalic vein aneurysms were isolated and a total resection of the vein, up to the joint of the elbow, was carried out. The surgical procedure lasted about two and half hours with 150–200 ml of total blood loss. The histological specimen was sent to pathological anatomy laboratory and subjected to hematoxylin and eosin staining, Weigert Von Gieson and immunohistochemical analysis for CD4+ and CD8+ lymphocytes. The histological evaluation showed large calcification of the vein wall (Fig. 2A), while the Weigert van Gieson for elastic and connective fibers highlighted the slipping of the wall and loss of collagen fibers (Fig. 2B). Finally, the immunohistochemical analysis for CD4+ and CD8+ lymphocytes showed intense inflammatory infiltration of the intimate, medium and adventitia of the degenerated vessel (Fig. 2C) No bleeding or ischemia nor nerve injury of the hand resulted in the postoperative period. After one month a duplex scan and blood tests were performed, respectively showing radial artery patency and normalization of serum creatinine levels (1.1 mg/dl). The patient was doing well 6 months after the procedure.

## 3. Discussion

The maturation of an AVF involves some histopathological changes in the arterial and venous system which are influenced by hemodynamic aspects. Usually the normal caliber of the cephalic vein is about 2.3–2.6 mm however the creation of an AVF for hemodialysis determines a process of ärterializationöf the vein resulting in a significant increase in its caliber. The role that immunosuppressive drugs and corticosteroids play in the evolution of aneurysmal disease is still controversial and often debated [2,4]. Corticosteroids have often been shown to cause arterial wall damage although no report has yet directly proven an aneurysmatogenic effect. Conversely, the hypertensive effect of corticosteroids is widely recognized as producing stress on the arterial wall and might have been the key factor in this case since our patient was hypertensive [5,6]. There are, however, other studies linking the adverse evolution of the disease to chronic therapy with these drugs due to potential damage of the arteries' muscular layers which leads to a significant increase in the incidence of aneurysms [7,8]. All of this could be explained by the multiple and different functions and link receptors that corticosteroids play in our body. Conflicting studies also exist on the need to close the AVF after kidney transplantation. In fact, we found that some authors recommend the closure of the fistula [9] on account of the reduction in

**Fig. 2.** Histological and immunoistochemical analysis: 2A) Hematoxylin and Eosin; 2B) Weigert Van Gieson; 2C) CD8+ perivasal.

cardiac mass (left ventricle) with a percentage around 15.8 % at 21 months that could be linked to a reduction in heart disease [10,11]. In their meta-analysis Zheng et al. demonstrated that AVF closure improves cardiac morphology and kidney graft function, resulting in improved renal perfusion [12]. A recent clinical trial showed that AVF ligation was associated with a significant reduction in the left ventricle myocardial mass (verified with cardiac-MRI) and NT-proBNP levels [13]. Instead other authors argue that there is no real benefit to fistula closure in renal transplant recipients who might benefit from hemodialysis treatment in cases of graft failure and that its closure should be performed only for symptomatic patients with severe venous hypertension, risk of rupture from pseudoaneurysm, significant high-output cardiac failure or ischemic hand [14]. In line with this assertion Weekers et al. described a significant acceleration of eGFR decline over the 12 months following the closure of a functioning AVF in kidney transplant recipients (KTRs) [15]. A recent study has also shown that even in cases of closure of the AVF in renal transplant patients undergoing chronic therapy with corticosteroids and/or immunosuppressive drugs, an increased risk of developing arterial aneurysms may be associated [16].

## 4. Conclusion

Nowadays current guidelines on postoperative care of KTRs do not give clear recommendations on management of AVF for stable kidney transplant recipients. Based on our clinical experience, the decision to surgically close an AVF should be highly personalized in every patient. Even if the rate of graft failure can also occur after 10- or more years from transplantation, the risk of AVF-linked complications is high. Furthermore, the surgical correction of those complications is not always easy to perform, as in our reported patient's case. Although many authors determine long-term graft survival using short-term graft function as a predictor, the serum creatinine level at one year is in fact closely predictive of graft survival [17]. Another parameter to consider is the fistula blood flow. Patients with a fistula blood flow >2 L/min are traditionally at increased risk for the development of cardiac failure and renal allograft dysfunction through high venous pressure and therefore would perhaps benefit more from fistula closure [18,19].

For these reasons and based upon our experience in this case report, we suggest not ligating the vascular access the first year following transplantation except in cases of patients needing emergent closure such as for severe venous hypertension, risk of rupture from pseudoaneurysm, or significant high output cardiac failure or ischemic hand. Asides from these, surgical closing to prevent the onset of complications could be considered a viable option in subsets of patients who are 3 or more years from transplantation with good and stable renal function, or have a significant growth of venous aneurysms, have a high AVF flow rate or are young in age.

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## Ethical approval

None.

## Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

## Author contribution

M. Panagrosso, A. Peluso and A. Viscardi wrote the manuscript. U. M. Bracale, L. Del Guercio and E. Dinoto supervised the writing of the manuscript.

## Registration of research studies

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## Declaration of Competing Interest

The authors report no declarations of interest.

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