

Repeated venipuncture as a reason of aneurysm and pseudoaneurysm of vascular access

Laura Leci Tahiri (✉ lauraleci@yahoo.com)

University Clinical Center of Kosovo, Clinic of Vascular Surgery

Afrim Tahiri

University Clinical Center of Kosovo, Clinic of Vascular Surgery

Harieta Zherka Saracini

University Clinical Center of Kosovo, Clinic of Vascular Surgery

Case Report

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Abstract

The most complications of the vascular access are: thrombosis, aneurysm, infection. Aneurysms can be either true, containing all layers of a venous wall, or false (pseudoaneurysm), lined by fibrous tissue and thrombosis.

Aneurysm dilatation is one of the major complications of vascular access. The incidence increased with the duration of the usage, repeated puncture at the same or nearby site, and increased intraluminal pressure of the graft. We present an uncommon case in which aneurysm and pseudoaneurysm of the native fistula is caused by puncture, in both sides. Repeated punctures at the same site, may progressively weaken the venous wall resulting in dilation of the outflow vein.

A 68-year-old Albanian woman had been in a hemodialysis program for 4 years, using a left brachiocephalic fistula. The inflow artery, outflow vein, and the deep veins were examined in detail. During the study period the patient had three surgeries, for aneurysm of hemodialysis access on one hand, and for pseudoaneurysm of hemodialysis access on the other hand. But, even that the patient survived and everything went well.

The idea of our paper was that in patients we have predisposition for the formation of aneurysm and pseudoaneurysm, the medical staff have more frequent meetings, so that such cases are treated more specifically, with more frequent visits to vascular surgeon, with more frequent measurements of draining vein diameter and flow of vascular access. The K/DOQI guidelines recommend a regular program of monitoring and surveillance of the vascular access. Color Doppler ultrasound is considered a valuable tool in the preoperative evaluation and in the follow-up.

Introduction

The most complications of the vascular access are: thrombosis, aneurysm, infection. Aneurysms can be either true, containing all layers of a venous wall, or false (pseudoaneurysm), lined by fibrous tissue and thrombosis.

Aneurysm dilatation is one of the major complications of vascular access. The incidence increased with the duration of the usage, repeated puncture at the same or nearby site, and increased intraluminal pressure of the graft. Surgical intervention is indicated where there is expansive growth with a diameter greater than 2cm and rupture or impending rupture^(1,2,3,4).

It is therefore, not advisable to puncture the same spot repeatedly. For these reasons the superficialized arterial segment should be long enough to allow an adequate selection of sites for puncture. Aneurysmorrhaphy is indicated for small aneurysms, with the diameter smaller than 2 cm, although

excision followed by interposition of vascular graft is often required for larger ones. Pseudoneurysm occur at the site of needling/puncture or at the anastomosis^(2,4,5,6,7).

Material And Methods

A 68-year-old Albanian women had been in a hemodialysis program for 4 years, using a left brachiocephalic fistula. The inflow artery, outflow vein, and the deep veins were examined in detail.

For reconstruction of the native arteriovenous fistula, the minimum diameter of artery and vein had to be >2mm. While in terms of aneurysm, different authors define it as dilatation to more than three times the native vessel diameter, with the minimum size being 2cm.

The inflow artery and the outflow vein were examined by duplex ultrasound scan with linear transducers of 7-15 MHz. The aneurysm size was 3.3cm, with excellent function, otherwise asymptomatic and the time to treatment from the creation of the AVF was 4 years.

Reason for repairing the aneurysm were skin changes with thinnig and erosion, with bleeding, inflammation, pain, oedema, a shortened area of cannulation, impossible to canulate because of risk of spontanoeous rupture (fig.1).

No oedema or collateral venous circulation was present. The patient underwent reconstruction of the same fistula, with resection of the 2.5cm of cephalic vein and aneurysmorrhaphy of the cephalic vein. A long lateral incision overlying the cephalic vein was performed, managing aneurysm excision (fig.2).

After six months of using the fistula patient have had an cerebrovascular insult, after which she went on Unit of Intensive Care with hypotension and loss of consciousness. As a result of this the fistula thromboses. The patient has a central venous catheter placed in femoral vein. After the improvement of the general condition of the patient, the right brachio-cephalic fistula was created, because the left basilic vein was very weak in diameter. Everything went well and after 6 weeks the fistula was ready for puncture, patient did regular hemodialysis three times per week.

After three months of use, patient came urgent in Emergency Room from the local hemodialysis center, with severe pain and oedema of the right arm, that happened after needling/puncture of the fistula (fig.3). On physical exam we found out skin thinning and shiny atrophic skin, large pulsatile mass, with thrill on right arm, above cubital fossa, which was indication for next surgery (fig.4).

Discussion

One third of arteriovenous fistulas develop complications including thrombosis (51.6%), stenosis (22.6%), aneurysm formation (6.7%) and infection (6.5%). Risk factors for these complications include: hypotension, hypertension, early puncture of the AVF, repeated puncture in the same site, external mechanical compression for hemostasis after removing needling. Pseudoaneurysm maybe thought as

hematomas communicating with the lumen of the access, which with time can develop a fibrotic sac^(1,3,6,7,8).

If an aneurysm has ruptured or there is a risk of imminent rupture (skin ulceration and infection), like in our case, emergency ligation of the aneurysm is required.

We present an uncommon case in which aneurysm and pseudoaneurysm of the native fistula is caused by puncture, in both sides. Repeated punctures at the same site, may progressively weaken the venous wall resulting in dilation of the outflow vein.

Therefore it is demonstrated that even in long term AVF with aneurysm and pseudoaneurysm after needling it is advisable to try to salvage the access. At our patient we improved the quality of hemodialysis and no other venous segments or graft prothesis were used for the access salvage.

According to the **Kidney Disease Outcomes Quality Initiative (KDOQI)** recommendations, the fistula with a native ideal vein must present at least 6 mm in diameter and flow superior to 600 mL/min, and be at a depth of 0.5 to 1 cm of the skin.

After the surgery, has presented some problems that we solved immediately, trying to avoid the need for a central venous catheter. The patient is feeling good, still performing the hemodialysis on her native fistula, on right side. We recommend her to change the needling site each time she perform hemodialysis.

To avoid loss of access and to prevent disastrous complications, the National Kidney Foundation Disease Outcomes Quality Initiative guidelines recommend that cannulation of the aneurysmal vein should be avoided. In our case, even though the patient had aneurysmal outflow vein, she remained stable and asymptomatic, without compromising hemodialysis at all, till erosion and bleeding happened. She was afraid to lose her vascular access, therefore she was reluctant to notify the vascular surgeon despite the recommendation of the nephrologist^(8,9,10,11,12).

Alternative treatment modalities for aneurysm of AVF include: excision and primary anastomosis, open plication with sutures and stapling devices to re-fashion the aneurysm and reduce the volume of the sac, excision and interposition of venous or prosthetic graft, and ligation of access when patient have had renal transplantation. Some authors suggest balloon angioplasty for stenosis in some segments of outflow vein away from aneurysmal part.

Alternative treatment modalities for pseudoaneurysm of AVF include: thrombin injection or ultrasound compression for small pseudoaneurysms and surgical repair for large pseudoaneurysms to prevent local complications or enlargement.

Some patients may have a predisposition to aneurysm formation. We considered this as a possible condition to our patient, so we after surgery recommend needling sites changed and blunt needles used if possible^(3,4,7).

There are several important factors and conditions to consider in maintaining long term function of the vascular access. It is very important to maintain a normal volume status. It is well known that hypotension from dehydration is one of the most common causes of thrombosis of vascular access. Local factors also contribute to thrombosis of vascular access, including mispuncturing and formation of hematomas, compression of hematoma, repuncturing with the same needle causes contamination. Antiplatelet drugs such as dipyridamole, ticlopidine and prostaglandins may be used to prevent thickening of the intima and occlusion of the draining vein^(6,8,9,11).

The idea of our paper was that in patients we have predisposition for the formation of aneurysm and pseudoaneurysm, the medical staff have more frequent meetings, so that such cases are treated more specifically, with more frequent visits to vascular surgeon, with more frequent measurements of draining vein diameter and flow of vascular access. The K/DOQI guidelines recommend a regular program of monitoring and surveillance of the vascular access. Color Doppler ultrasound is considered a valuable tool in the preoperative evaluation and in the follow-up.

Also, patients due to the general aggravated condition, receive a lot of parenteral therapy, which mainly nurses of hemodialysis patients should take into account, not to damage the large veins which in the future will be used to realize the vascular access.

Declarations

No conflict of interest.

No funding.

Consent

The patient signed an informed consent document to participate and provided her permission regarding publishing her data and photographs.

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Figures



Figure 1

Skin ulceration and aneurysm of vascular access.



Figure 2

Surgical approach to aneurysm of left cephalic vein.



Figure 3

Pseudoaneurysm in the sit of venipuncture of right brachio-cephalic arteriovenous fisula, near anastomosis.

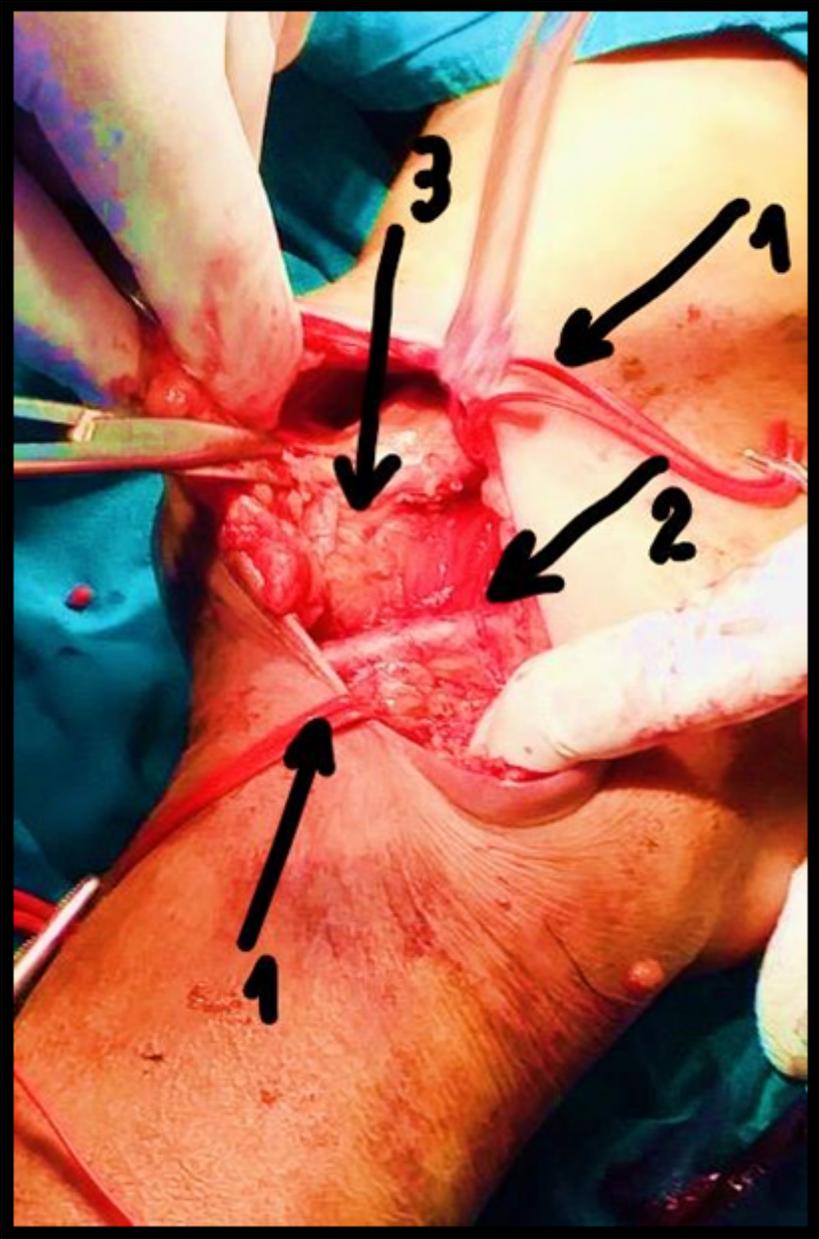


Figure 4

Surgical approach. 1. right brachial artery: 2. right nervus medianus: 3. Pseudoaneurysm in right cephalic vein