Open Journal of
Clinical & Medical
Case Reports

Volume 4 (2018)
Issue 19

ISSN 2379-1039

Repair of an excessive brachiocephalic aneurysm in a hemodialysis patient and review on therapeutic options for aneurysmal fistula management

Georgios Sahsamanis*; Nektarios Charisis; George Galyfos; Christiana Anastasiadou; Antonios Chalkias

***Georgios Sahsamanis**

Department of Vascular Surgery, 401 Army General Hospital of Athens, Greece
Email: sachsamanis@hotmail.com

Abstract

Although establishment and maintenance of renal access in hemodialysis patients is a mandatory procedure, creation of an arteriovenous fistula is often accompanied by a number of complications, one of which is formation of a true aneurysm. 72-year-old patient suffering from end stage renal disease, presented to our department due to discomfort, caused by an excessive aneurysm of his cephalic vein, on an otherwise well-functioning arteriovenous fistula. He underwent successful ligation and excision of the foresaid aneurysm, while a new arteriovenous fistula was created on his contralateral arm at wrist level. Management of an arteriovenous fistula aneurysm in a hemodialysis patient represents a must-know procedure for the vascular surgeon, since it may lead to possible fatal complications such as rupture or hemorrhage. A number of techniques have been described for such cases, ranging from open surgery with salvaging of the previously existing fistula, or the creation of a new one. Staple aneurysmorrhaphy represents an alternate viable option, eliminating the requirement for a temporary catheter placement, while endovascular techniques are usually reserved for emergency cases or high-risk patients.

Keywords

hemodialysis; AV fistula; renal access; AV aneurysm

Introduction

Creation and maintenance of vascular access in end-stage renal disease patients is of outmost importance. It involves the formation of an arteriovenous anastomosis, in order to achieve dilatation and thickening of the target vein wall. After an initial 'maturation' stage which lasts approximately 30 days, the fistula can be used for hemodialysis. In some cases, this dilatation may further continue, leading to the formation of an aneurysmal vein. These aneurysms are often associated with symptoms such as pain, while a number of possible complications such as rupture may necessitate their prompt management. This paper aims to present the successful repair of a giant aneurysm of the cephalic vein in a patient undergoing hemodialysis through open surgery and to provide insight into the various surgical options for management of such cases.

Case Report

A 72-year-old male was referred to our department complaining of mild right upper arm discomfort for the past 6 months. He was under regular hemodialysis (3 – 4 times per week) due to end stage renal failure diagnosed 5 years ago. A right sided brachiocephalic Arteriovenous Fistula (AVF) was used for his hemodialysis sessions, established at the time of diagnosis. The fistula was functional, although a dilatation of the cephalic vein occurred approximately 3 years ago, leading to the formation of an excessive aneurysm of the cephalic vein, and progressive discomfort to the patient.

No medical history of diabetes mellitus or hypertension was recorded. An area cannulation technique was being applied during dialysis sessions, with 15 G needles and the needle bevel in an upward position. Blood flow rate during dialysis was 250-300 ml/min, while no vein dilatation was recorded during the first two years of dialysis.

Patient's pre-operative laboratory and biochemistry records were within normal limits, with a hematocrit of 37.2% and hemoglobin of 10.4 g/dL. Additionally, a color duplex ultrasound scan of his upper arm was performed, showing an enlarged aneurysm of his right cephalic vein with a maximum diameter of 6cm. Vessel lumen was patent, although extended thrombotic lesions were identified. Due to patient's good overall medical condition, the increased possibility of a rupture due to aneurysmal size and the mild discomfort caused to the patient, a decision was taken for exclusion of the aneurysmal fistula. Our limited experience in various techniques in dealing with AVF aneurysms, we decided that ligation and excision of the pathologic part of the cephalic vein along with creation of a new AVF in the contralateral arm was the best course of action. After written consent, patient was taken to the operating theater.

Under local anesthesia, a longitudinal incision was performed above the aneurysm. After careful dissection and mobilization, the aneurysmal cephalic vein was identified, approximately 20cm in length and maximum 6cm in diameter (Figure 1). The aneurysm was ligated in its proximal and distal ends and excised, while a prosthetic patch was placed in the brachial artery, for closure of the brachiocephalic connection point. On the contralateral arm, a new radial cephalic fistula was created at wrist level with adequate blood flow. Lastly a temporary hemodialysis catheter was placed in patient's superior vena cava, which was removed after maturation of the newly created AVF.

Postoperative period was uneventful for the patient. A mild swelling of his right arm was observed but subsided, while the newly created AVF was functional after approximately 30 days.

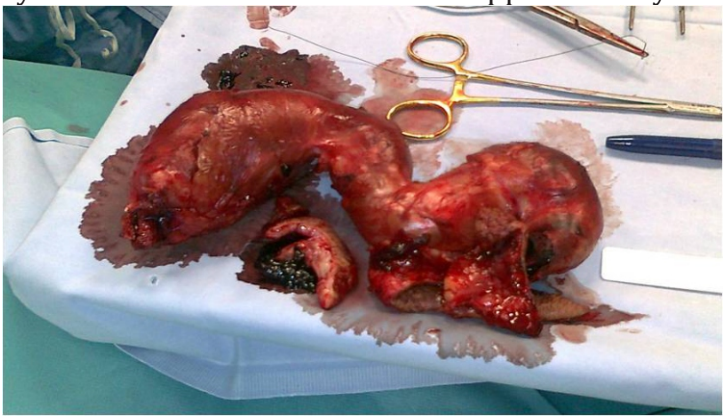

Figure 1: Excessive cephalic aneurysm specimen. Proximal and distal ends were ligated, while a new arteriovenous fistula was formed on the contralateral arm.

Discussion

Formation of an AVF involves upper extremity vessels, with a number of techniques being described in the medical literature [1]. While their creation normally leads to dilatation of the target vein, this may further lead to the development of a true aneurysm, which usually leaves the functionality of the fistula unaffected [2]. A number of factors have been incriminated for the creation of these AVF aneurysms. Repeated puncture of the vein during hemodialysis sessions is considered the most common factor, due to weakening of the venous wall [3]. In addition, some authors report that the presence of stenotic lesions can lead to the creation of aneurysms, due to abnormal hemodynamics and blood flow inside the vessel lumen [2,3]. Connective tissue disorders have also been associated with creation of aneurismal dilatations [3].

A number of classification systems have been proposed by various authors, with most of them coming to the agreement that an AVF aneurysm is defined as a 3-fold increase in the native vessel's diameter [2,4]. The absence of a uniform definition of AVF aneurysm is probably held account for their wide incidence range, which varies from 5% to 60% [2,4,5]. In a recent study by Valenti et al, an alternate classification system of AVF aneurysms was proposed, categorizing AVF aneurysms in 4 types, according to their shape and morphology [2]. Type I aneurysms include uniformly aneurysmatic veins, and veins dilated in their proximal end, while Type II comprise localized aneurismal dilatations. Type III represent complex unclassified aneurysms, and type IV refers to the formation of false aneurysms (pseudoaneurysms) [2].

Although the presence alone of a functioning aneurysmal AVF does not justify operation, early management of excessive, or symptomatic AVF aneurysms is recommended in some cases, due to the possibility of potentially fatal complications, such as rupture and hemorrhage. In addition, such aneurysms may lead to embolism, venous hypertension or even cause local compression symptoms [6]. In our case, although the fistula was functional, patient's discomfort along with the sheer size of the aneurysm led to the decision of surgical excision.

Various surgical techniques have been described for management of AVF aneurysms [1]. Selecting the most appropriate, someone should take into consideration both the patient's medical status and the surgeon's expertise. Surgical ligation and excision of the aneurysm followed by the creation of a new fistula on either on the previous aneurysmal site or on the contralateral arm is a commonly used method of dealing with AVF aneurysms [7]. In both cases an autogenous or prosthetic graft can be used for maintaining renal access. This method offers good long-term patency results, while it requires less surgical experience. Its advantages and disadvantages are material-dependent, with prosthetic grafts offering immediate postoperative access avoiding the need of a temporal catheter, although they are associated with increased infectious risk. On the other side, autogenous grafts require the newly-formed AVF to mature in approximately 4-6 weeks in order to be used for hemodialysis, making the placement of a temporal catheter necessary [3]. In a recent study, Cingoz F et al treated 28 patients with AVF aneurysm through aneurysm excision, and creation of a new AVF in the salvaged site using a prosthetic graft. Their technical success rate was 100%, with only one case of post-operative infection, while vessel patency at 3-years follow-up was recorder at 100% [7]. In another study, Pasklinsky et al treated 7 patients who were suffering from AVF aneurysm through ligation and autologous graft interposition in the previous

AVF location. During the 18-month follow up 6 of them maintained vessel patency, while 1 case required the creation of a new AVF in the contralateral arm due to thrombosis [4].

Another technique for surgical management of aneurysmatic AVFs is staple aneurysmorrhaphy. It involves the application of a stapler in order to exclude the aneurysmatic sac and maintain vessel patency [8,9]. This method provides the patient with immediate vascular dialysis access, while it also eliminates the need for the creation of a new AVF. Piccolo et al reported successful salvage of AVF aneurysm in 10 patients through aneurysmorraphy using a TA stapler. Their 6-month patency was reported at 80% [8]. In another analysis, Vo et al performed stapled aneurysmorraphy in 40 patients, with primary patency at 12-month follow up at 67%, primary assisted patency at 8%, and secondary patency at 91% [9]. The only major drawback of this method seems to be an increase in required surgical experience, while Vo et al additionally suggest that the presence of a thick and fibrotic aneurysmal wall is mandatory for adequate hemostasis during stapler application [9].

Endovascular techniques provide a viable alternate in management of AVF aneurysms. The aneurysmal sac may be excluded through placement of a stent graft or a covered stent inside the vein lumen, although endovascular options are usually reserved for emergency cases or high-risk patients who are unable to tolerate open surgery [6]. A new endovascular technique was recently presented by Rabellino et al for salvage of extensively thrombosed AVF aneurysms. This technique involved the creation of a tunnel through the thrombosed area, and introduction of an auto-expandable stent. Their technical success rate was 100% while no major complications were observed [10].

Conclusion

In conclusion, formation of an AVF aneurysm in a hemodialysis patient is a development which may further lead to symptoms or potential complications. Although cases of well-functioning AVF aneurysms do not require surgical intervention, the development of symptoms may necessitate their management. On the other side, prompt surgical management is advised in cases of excessive aneurysms, due to their potentially life threatening complications. While a number of durable surgical options with excellent technical success rates are available, a patient tailored management should be considered the best approach, after taking into consideration the patient's medical status and surgical experience.

References

1. Chisci E, Harris LM, Menici F, Frosini P, Romano E, Troisi N, et al. Outcomes of three types of native arteriovenous fistula in a single center. J Vasc Access. 2017: 11; 18: 379-383.

2. Valenti D, Mistry H, Stephenson M. A novel classification system for autogenous arteriovenous fistula aneurysms in renal access patients.Vasc Endovasc Surg. 2014; 48: 491-496.

3. Mudoni A, Cornacchiari M, Gallieni M, Guastoni C, McGrogan D, Logias F, et al. Aneurysms and pseudoaneurysms in dialysis access. Clin Kidney J. 2015; 8: 363-367.

4. Pasklinsky G, Meisner RJ, Labropoulos N, Leon L, Gasparis AP, Landau D, et al. Management of true aneurysms of hemodialysis access fistulas. J Vasc Surg. 2011; 53: 1291-1297

5. Jankovic A, Donfrid B, Adam J, Ilic M, Djuric Z, Damjanovic T. Arteriovenous fistula aneurysm in patients on regular hemodialysis: prevalence and risk factors. Nephron Clin Pract. 2013; 124: 94-98.

6. Inui T, Boulom V, Bandyk D, Lane JS 3rd, Owens E, Barleban A. Dialysis Access Hemorrhage: Access Rescue from a

Surgical Emergency. Ann Vasc Surg. 2017; 42: 45-49.

7. Cingoz F, Gunay C, Guler A, Sahin MA, Oz BS, Arslan M. Surgical repair of aneurysm of arteriovenous fistula in patients with chronic renal failure. Kardiochir Torakochirurgia Pol. 2014 ; 11: 17-20.

8. Piccolo C 3rd, Madden N, Famularo M, Domer G, Mannella W. Partial Aneurysmectomy of Venous Aneurysms in Arteriovenous Dialysis Fistulas. Vasc Endovascular Surg. 2015; 49: 124-128.

9. Vo T, Tumbaga G, Aka P, Behseresht J, Hsu J, Tayarrah M. Staple aneurysmorrhaphy to salvage autogenous arteriovenous fistulas with aneurysm-related complications. J Vasc Surg. 2015 ; 61 : 457-462.

10. Rabellino M, Rosa-Diez GJ, Shinzato SA, Rodriguez P, Peralta OA, Crucelegui MS, et al. Stent tunnel technique to save thrombosed native hemodialysis fistula with extensive venous aneurysm. Int J Nephrol Renovasc Dis. 2017; 10: 215-219.

Manuscript Information: Received: August 18, 2018; Accepted: October 10, 2018; Published: October 15, 2018

Authors Information: Georgios Sahsamanis[1]*; Nektarios Charisis[1]; George Galyfos[2]; Christiana Anastasiadou[2]; Antonios Chalkias[1]

[1]Department of Vascular Surgery, 401 Army General Hospital of Athens, Greece
[2]Department of Vascular Surgery, General Hospital of Athens 'KAT', Greece

Citation: Sahsamanis G, Charisis N, Galyfos G, Anastasiadou C, Chalkias A. Repair of an excessive brachiocephalic aneurysm in a hemodialysis patient and review on therapeutic options for aneurysmal fistula management. Open J Clin Med Case Rep. 2018; 1472.

Journal: Open Journal of Clinical and Medical Case Reports is an international, open access, peer reviewed Journal focusing exclusively on case reports covering all areas of clinical & medical sciences.

Visit the journal website at **www.jclinmedcasereports.com**
For reprints and other information, contact editorial office at **info@jclinmedcasereports.com**