The creation of an arteriovenous fistula (AVF) is frequently used to achieve easier access for haemodialysis in patients with chronic renal insufficiency. The most frequent late complication of AVFs is aneurysm formation, which carries the risk of spontaneous rupture. This study reports on 18 patients with giant aneurysms that developed on antebrachial AVFs who were operated on over a period of 6 years. Colour duplex ultrasonographic examination of the upper extremity was performed in all but one patient in the preoperative period. Surgical management included resection of the aneurysm and re-establishment of arterial continuity. There were no complications such as infection, ischaemic extremity loss, neurological sequelae or mortality. Colour duplex ultrasonographic examinations after 6 months were all normal. The mean follow-up period was 29.1 months (range 7 – 50 months). There were no additional vascular complications observed during follow-up. Early surgical intervention is the recommended treatment of choice for giant aneurysm complicating antebrachial AVF.

**KEY WORDS:** GIANT ANEURYSM; ARTERIOVENOUS FISTULA; HAEMODIALYSIS

**Introduction**

Owing to the increasing number of patients, which exceeds the number of kidney donors, haemodialysis remains the only available lifelong therapy for most patients with chronic renal failure (CRF).¹ The creation of an arteriovenous fistula (AVF) is a widely performed procedure that is used to achieve easier access and increase the quality of life for CRF patients on haemodialysis.² Complications related to AVFs have been encountered much more often in recent years because of the expanding population of this patient group. In addition to haemodynamic instabilities, such fistulae are prone to early haemorrhagic, thrombotic and ischaemic complications, as well as late aneurysm development, especially in the brachial region. The development of an aneurysm mostly results from fistula usage, and reduces the patient’s quality of life and survival.³

We present our experience of the surgical management of giant aneurysms that have...
developed as a complication of antebrachial AVFs, and discuss this in the light of the current literature.

Materials and methods

PATIENTS

Patients who underwent resection of a giant aneurysm over a period of 6 years between June 1997 and June 2003 within the University of Dokuz Eylül and the Alsancak State Hospital, Izmir, Turkey were included in the study. The pulsatile mass and radial and ulnar pulses were assessed, and the Allen test was used to make the diagnosis. Colour Doppler ultrasonography was used for confirmation. In all patients the aetiological factor in the formation of the aneurysm was the presence of an AVF in the antebrachial region, created for the purpose of haemodialysis access.

Full ethical approval was not obtained for this study because no ethical committee has been established in our institution. Consequently, it was not hospital policy to collect informed consent routinely from all patients.

SURGERY

Surgery was performed under regional anaesthesia with bupivacaine. After incising and separating the overlying thin layer of skin, the proximal and distal segments of the brachial artery were identified (Fig. 1). Clamps were placed proximally and distally, and the aneurysm capsule was opened using a direct incision. The large amount of organized thrombus material was removed, and the aneurysmal sac was resected and sent for histopathological and microbiological examination. Arterial continuity was then re-established.

The accompanying veins were resected in all cases. After the placement of a drain into the aneurysmal cavity, haemostasis was achieved and the tissues were closed.

Results

A total of 18 patients underwent resection of a giant aneurysm complicating an antebrachial AVF during the 6-year study period. Of these, 11 (61.1%) were male and seven (38.9%) were female. The mean age was 43.1 years (range 19 – 69 years). In 15 patients (83.3%), the AVF was located antecubitaly. The mean period between AVF creation and hospitalization for aneurysm was 26.3 months (range 18 – 51 months).

All 18 patients had a growing pulsatile mass at the site of their AVF in the upper extremity. A systolic murmur was heard over the aneurysmatic mass, the radial and ulnar pulses were intact, and the Allen test was negative in all patients. The diagnosis was verified by colour duplex ultrasonographic examination in all but one patient (in whom the technique could not be performed; Fig. 2). In two patients a new AVF was created in a different extremity prior to resection of the aneurysm.

There were no cases of mortality or complications such as ischaemic extremity loss, neurological sequelae or infection. No microbiological agents were detected within
the materials extracted from the aneurysmal sacs. All the cases appeared at operation to be true aneurysms, and this was confirmed on histopathological examination.

The radial and ulnar pulses were intact in the early post-operative period in all cases. Thromboembolectomy was not required in any of the cases during either the early or the late post-operative period.

The mean follow-up period was 29.1 months (range 7 – 50 months), and the mean hospital stay was 3.6 days (range 3 – 6 days). Duplex ultrasonographic examinations performed 6 months post-operatively were normal in all patients. There were no vascular complications during the follow-up period, all the patients were able to continue their haemodialysis programme, and the aneurysm did not recur in any patient.

Discussion

Renal transplantation is the best choice for patients with CRF but, because of insufficient donors, haemodialysis may be the only long-term therapy available.4 The creation of an AVF is widely performed to achieve easier access and increase the quality of life for CRF patients on haemodialysis. The most common late complication of AVF formation is the development of an aneurysm, which is generally a true aneurysm.5 Prevention of aneurysm is helped by the diameter of the fistula being less than 75% of the diameter of the artery, and by avoiding repeated puncture of the fistula in the same place.

In a clinical study reporting on the diagnosis and treatment strategies in upper extremity aneurysms distal to the axillary artery, 67% of the patients presented with a pulsatile mass.6 In our series, all cases complained of a pulsatile mass, but not of pain or swelling. In most cases the diagnosis is suggested by the history and physical examination. Colour Doppler ultrasonography, which is a non-invasive method, usually gives sufficient information to confirm the diagnosis; in particular, duplex examination has a very high sensitivity and specificity. This technique not only demonstrates the blood filling the cavity, but can also show the jet flow passing from the arterial defect.7 Colour Doppler ultrasonography was performed in all but one of our patients, and was helpful in confirming the diagnosis and choosing the appropriate surgical approach. Other tools that may be helpful in the diagnosis of aneurysm are magnetic resonance angiography of the upper extremity and/or fistulography with concomitant upper extremity arteriography.

When an aneurysm develops, it may be partially resected and the fistula maintained, or the fistula can be closed and a new one created. Treatment modalities for aneurysms developing as a complication of AVF include manual ligation and compression under ultrasonographic guidance, endovascular graft implantation, embolization, thrombin injection under ultrasonographic guidance and surgical reconstruction.6,8,9

FIGURE 2: Forward jet flow in the systolic period and retrograde flow to the vascular lumen in the diastolic period within the aneurysmal sac can be identified on colour duplex examination.
The use of endovascular techniques or interventions guided by ultrasonography is common, but the traditional surgical approach still maintains its place as the best treatment modality. Treatment should be undertaken as an emergency in these types of aneurysms because of the risks of local compressive symptoms, rupture and embolism. If untreated, dilatation, venous hypertension or distal ischaemia may also occur. If the diagnosis is clear on physical examination and/or ultrasonography, there is no need for angiography, although an angiographic assessment may be beneficial when distal perfusion is compromised.

The results of the surgical management of aneurysms complicating AVFs reported here are good, with no complications. Early surgical intervention is the recommended therapy of choice in such cases because of the risk of spontaneous rupture. The propensity of fistulae in the antecubital area to develop complications such as aneurysms must be borne in mind when choosing this anatomical site for the formation of AVFs for haemodialysis.

Received for publication 1 October 2003 • Accepted subject to revision 20 October 2003 • Revised accepted 27 November 2003

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References

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