Abstract

Background Pseudoaneurysm (PS) and aneurismal dilation of vein (ADV) are recognized complications of arteriovenous fistulas (AVF) in patients on hemodialysis. We present our experience about surgical management of these complications, which resulted in AVF preservation for continuing hemodialysis.

Material and methods Twenty-two patients underwent surgical repair of an aneurismal dilation of vein or a pseudoaneurysm arising from a native AVF. In 14 patients the aneurismal dilation of vein arose from the venous limb of AVF and in eight patients the pseudoaneurysm arose from an arteriovenous anastomatic site in the antecubital and anterior part of arm. The mean follow-up period was 15 months. Clamp Aneurysm Repair (CAR) was performed to repair the aneurismal dilation of venous limb of AVF and Tourniquet Aneurysm Repair (TAR) was performed to repair PS that arose from AVF in the antecubital and anterior part of arm.

Results In eight of the 14 patients with aneurismal dilation of vein, who underwent CAR procedure, vascular access was preserved. In three patients with aneurismal dilation of vein in snuffbox and one in forearm, the AVF had failed due to prior venous thrombosis of AVF. In two of 14 patients, there was no need for preservation of AVF because of renal transplantation. The technical success rate and patency rate during follow up period in CAR method was 100%. In seven of eight patients with pseudoaneurysm in the antecubital and anterior part of arm, who underwent TAR procedure, the AVF remained patent. The technical success rate in TAR method was 87.5%, and the patency rate was 87.5%. Overall, technical success rate was 95.45% and patency rate was 93.75%. During the 15 months of follow up period hemodialysis program through the repaired AVF sustained as desired.

Conclusions The surgical methods used in our study could effectively repair the aneurismal dilation of vein and pseudoaneurysm arising from a native AVF, and it lead to preservation of the AVF patency for continuing hemodialysis. These methods are technically feasible, safe and cost-effective procedures. It does not require dissection and additional incision for control of the vein and artery proximal and distal to the aneurismal dilation of vein and pseudoaneurysm; result in shorter time of procedure without complications.

Keywords Aneurysm · Dilation · Pseudoaneurysm · Arteriovenous fistula · Hemodialysis

Introduction

Hemodialysis access fistulas were developed as a long-term therapeutic device in the management of severe renal insufficiency. Vascular access patency for dialysis is
main problem in patients who undergo long-term hemodialysis [1]. Native arteriovenous fistula (AVF) are generally considered preferable in comparison with other vascular access, because they are less often associated with complications such as infection, pseudoaneurysm (PS), venous hypertension, and vascular steal than prosthetic grafts [2], also they have a better patency rate compared to prosthetic grafts [3].

Complications related to AVFs have been encountered much more often in recent years because of the expanding population of this patient group. PS is the first major result of anastomotic line leakage following AVF creation, and aneurismal dilation of vein (ADV) is a recognized complication of AVFs, which mostly results from fistula usage. Vessel rupture and bleeding, thromboembolism, AVF thrombosis and failure, local skin ischemia and necrosis, infection and sepsis, extrinsic compression of nearby neurovascular structures, and significant blood loss have all been associated with ADV or PS. Considering to limited sites for AVF creation in hemodialysis patients, a series of multiple revision procedures were done to salvage and maintain access sites.

Treatment modalities for ADV and PS developing as a complication of AVF include: surgical ligation, ultrasound (US)-guided compression, placement of a covered stent, embolization, ultrasound (US)-guided percutaneous thrombin injection, and surgical reconstruction [4–7], but the traditional surgical approach still maintains its place as the best treatment modality [8].

Although the role of surgery has diminished since the development of less-invasive methods of treatment for ADV and PS, there are still other recognized indications for surgical repair such as: any PS at the site of a vascular anastomosis, mycotic PS, rapidly expanding PS; infected PS; failure of percutaneous treatment; and ischemic soft tissues and skin caused by local pressure [9–11].

In the past decade, the management of ADV and PS has changed completely. The main treatments have been ultrasound (US)-guided compression and US-guided percutaneous thrombin injection. US-guided compression has respectable success rates but is limited due to patient discomfort, long procedural times, and the relative ineffectiveness of the technique in anticoagulated patients [12–15]. In addition, there are just some case reports on the use of this method resulting in preservation of AVF patency [6]. US-guided percutaneous thrombin injection is effective in patients, who have undergone anticoagulation and seems to be the best method to treat PS, with very high technical success rates, minimal recurrence, and very low complication rates [6, 16–19]. But, thrombin injections should only be performed in patients who develop PS secondary to a catheterization procedure. Additionally, the AVF could not be preserved with the use of this method.

However, with the increasing number of elderly patients, and patients with co-morbid conditions such as cardiovascular disease and diabetes mellitus in the hemodialysis population, with limited sites for AVF creation, it is important to use a procedure for management of ADV and PS, which maintain the AVF patency.

We present our experience of surgical management of ADV and PS that have developed as a complication of AVF, which result in AVF preservation for continuing hemodialysis.

**Patients and methods**

**Patients**

During the period from February 2004 through June 2006, 22 patients were treated at the department of surgery, Shariati hospital affiliated to Tehran University of Medical Science, with an ADV or a PS arising from a native AVF. The patients included eight women and 14 men with a mean age of 40.7 years (range 17–67 years).

All 22 patients had the native AVF for hemodialysis; seven located in the snuffbox (between cephalic vein and dorsal branch of radial artery), four in the distal of forearm, radio-cephalic (between cephalic vein and radial artery), and 11 in the antecubital region, brachio-cephalic or brachio-basilic (between basilic or cephalic vein and brachial artery).

ADV arose from the venous limb of AVF in 14 patients that were in the snuffbox (n=7), distal of foream (n=4), and antecubital and anterior part of arm (n=3). PS arose from an arteriovenous anastomotic site in the antecubital and anterior part of arm in eight patients (Table 1).

The mean period between AVF creation and ADV or PS development was 15.2 months (range 3–28 months) [20, 21], in our study, the diagnosis of ADV and PS was made based on clinical examination. Other than size of the PS or ADV as an indication for repair, more important were the pulsatile mass overlying the AVF, and high risk for acute rupture or thrombosis.

The mean follow-up period was 15 months (range 9–18 months). Follow-up included physical examination regarding the ability of continuing hemodialysis through the repaired AVF. Palpable trill on the venous limb of AVF indicated preservation of access patency and AVF function. Although Color Doppler ultrasonography was performed post-operatively in four patients, showed no complications, AVF was clinically functional due to continuing hemodialysis, and there was no need for ultrasonography to confirm AVF function and patency in the other patients. The ethics committee approved the study, and written consent was obtained from all patients after they were duly informed of the nature of surgical procedure.