

Arterio-Venous Fistulae for Hemodialysis A Personal Experience in a Saudi Arabian Teaching Hospital

Majed Al-Awami

Department of Surgery, College of Medicine
King Faisal University,
Dammam, Kingdom of Saudi Arabia

Abstract:

Objective: To review personal experience in creating arterio-venous fistulae (AVF) for hemodialysis in a teaching hospital in Eastern Saudi Arabia.

Methods: Retrospective review of patient-charts extracting age, sex, nationality, type and side of the fistula created, and the outcome within six weeks from creation.

Results: 275 consecutive fistulae were created in 257 patients. 154 were male, and 103 females. Six weeks (maturation time) patency rate was 93 %, and over all complication rate was 8.8 % in the Brescia-Simino fistulae, while it was 28 % in the antecubital variety.

Conclusion: A Brescia-Simino AVF is the first choice when creating a vascular access for hemodialysis.

Introduction:

Chronic renal failure is a major and life threatening disease that taxes national resources. It is especially important in the Kingdom of Saudi Arabia where diabetes mellitus causes renal failure in up to 16-30 %⁽¹⁻²⁾ of kidney diseased patients.

Diabetes mellitus mal effect on the vascular tree, including that of the upper extremity, is well documented⁽³⁾. This includes blood supply to any created AVF and hand.

Accessing the circulation for hemodialysis is a major limiting step, and, is a life long hurdle in the well being of the chronically dialyzed patient. Here, a personal experience of 275 consecutive AVF created in 257 patients is reported.

Beside age, sex, and nationality, data on type of fistulae created and earlier outcome were retrieved and analyzed.

Of these 275 AVF, 250 were between radial artery and cephalic veins, and 25 between the brachial artery and a suitable (mostly cephalic) vein. Seven complications were encountered in the latter group.

Brescia-Cimino AVF became the procedure of choice ever since it was first created in 1966. We used this approach in 250 of the 275 created fistulae. We had 93 % patency rate compared with international rate of 75.5 – 81.3 % ⁽⁴⁻⁶⁾. The main causes of failure in AVF are the anatomical difficulty of small, sclerosed, or non-patent vein, atherosclerosis of the radial artery, and/ or no completion of the palmar arch leading to distal ischemia. Ipsilateral subclavian vein stenosis and its role in AVF failure ⁽⁷⁾, or limb swelling ⁽⁸⁾ add to the difficulties in AVF creation and sustainment.

Patients and methods:

This is a retrospective review of patient-charts. Beside demographic data of age, sex and nationality, data on site and type of fistulae created, date of creation, and outcome within the first six weeks were retrieved. Data were analyzed using SPSS for Windows version 6.

The completion of the palmar arch was assured by doing Allen test. The end of the cephalic vein was anastomosed to the side of the radial artery just proximal to the wrist joint. The non-dominant hand was used unless it was previously used or the vessels were not usable.

The patency rate was calculated at the time of expected maturation of the fistulae, which is six weeks from the date of creation. The fistula was re-explored on an emergency basis if, within the first five days of its creation, the flow was not satisfactory by physical examination and by Doppler ultrasound. It was considered not developed or failed, if, at six weeks from creation, it could not support the desired flow to the dialysis machine.

Acute complications looked for were thrombosis, active bleeding, and hematoma formation. Chronic complications included swelling around the fistula site, distal ischemia and non-usability.

Results:

We reviewed the charts of 257 patients (Table 1) Of these 154 were males and 103 females. Their age ranged between 14 and 81 years, (mean 45.3 years.) Over 77 % (200) were Saudi nationals, while the remaining 57 (22.2 %) were from 11 different nationalities. Of the Saudi nationals, 108 were males, and 92 were females.

We created 186 left sided AVFs (Table 2) and 64 right sided ones. Of this group, 17 AVF (10 left sided, and 7 right sided) were created in anticipation of a future need for hemodialysis. This report also includes 25 anticubital AVFs. These 275 fistulae had not been preceded by any other form of ipsilateral fistula creation.

Table (1)
Sex and Nationality of Patients Studied (N=257)

	Male (% of total)	Female (%)	Total (%)
Total	154 (60)	103 (40)	257 (100)
Saudis	108 (54)	92 (46)	200 (77.8)

Table (2)
Side and Outcome AVF Studied (N=250)

Side of operation	Imm. * / failed (% failed)	In-antic. ** / failed (% failed)	Total failed (%)	Total Operated
Right	57 / 2 (3.5)	7 / - (0)	2 (1.5)	64
Left	176 / 12 (7)	10 / 3 (30)	15 (8)	186
Total (%)	233 / 14 (6)	17 / 3 (18)	17 (7)	250

* Immediate need.

** Created in-anticipation of future need.

We re-operated on 19 fistulae on an emergency basis (Table 3) 14 for acute thrombosis, three for bleeding suture line, and two for evacuation of hematoma. Three other re-operations were to resect aneurysms which developed on the venous side of the suture line in this AVF group. 17 fistulae (3 in the anticipation to dialysis) failed to develop to the degree required for hemodialysis (Table 2)

Table (3)
Complications and Re-exploration seen in AVF (N=250)

Complication	Frequency	% Total fistulae
Thrombosis	14	5.6
Bleeding	3	1.2
Hematoma	2	0.8
Re-operation : Acute	19	7
“ “ : delayed	3 *	1.2
Over all	22	8.8

* Aneurysmectomy

Of the anticubital AVFs, seven required re-operation (Table 4) five were closed, two for severe distal ischemia, two for massive arm swelling and one for aneurysm at the fistula site. Two other fistulae underwent fistuloplasty for distal ischemia.

Table (4)
Re-operation Anticubital fistulae (N=7 out of total 25)

Complication	Closure (% total anticub. fist. *)	fistuloplasty (%)
Distal ischemia	2 (8)	2 (8)
Swelling	2 (8)	---
Aneurysm	1 (4)	---
Total complication	5 (20)	2 (8)

* anticubital fistulae

Over all complication rate = 28 %.

Discussion:

The need for vascular access is life long in patients on chronic hemodialysis, and it becomes a limiting factor in their well-being. It is necessary to preserve blood vessels for future revisions and new access formation.

Many factors affect the patency of created AVFs. Some are local such as the size of the fistula, patency of the blood vessel, and pliability of its wall. Loco-regional factors include venous hypertension due to proximal stenosis or obstruction ⁽⁷⁾, and atherosclerosis of the feeding artery, while systemic factors include hypercoagulable state. Synthetic conduits bear less patency rate, probably due to an over-growth of false intima.

In this group of patients, we addressed a specific issue, namely the use of native vessels on a side with no previous permanent or temporary access creation. We chose the site to be as distal in the extremity as possible, making sure, at the same time, to safe-guard the blood supply to the distal tissue by checking for the completion of the palmar arterial arch, and doing Allen test.

Our patency rate, being above 90 %, matches the better rates reported in the literature. At the same time, most of the complications we encountered were directly related to the fistula site. These complications were thrombosis, bleeding suture line, and hematoma collection. Threatened tissue, as manifested by distal ischemia, pain, and massive swelling, was seen in the antecubital subgroup of our patients.

Brescia-Simino AVF can be created by anastomosing the vein to the radial artery either by side-to-side, end-to-end, or end to side. The first option is associated with hand swelling ⁽⁹⁾, while the second option is associated with higher incidence of distal ischemia, specially if the palmar arch is not complete. End to side anastomosis is the safest ⁽¹⁰⁾. Our approach of end-to-side AVF supports these findings. We had no distal ischemia or swelling in this sub-group.

Distal ischemia is also reported in antecubital fistulae ⁽⁶⁾. We had four (16 %) patients suffered from distal ischemia among 25 fistulae created. Two of them needed closure of the fistulae because of the severity of symptoms, while the other two were treated successfully with fistuloplasty

(Table 4). Massive swelling of the arm is also reported with out-flow hypertension⁽¹¹⁻¹²⁾. Two (8 %) of the anticubital sub-group needed closure of the fistulae for this complication.

Conclusions and recommendations:

Our findings support the previous reports that end-to-side cephalic vein to radial artery fistula is the fistula of the first choice in access creation.

We also believe that the more distal the initial fistula is located the better since this approach spares vessels for future revisions and creation.

Proximal venous hypertension can be a source of future morbidity in these patients.

To decrease the possibility of this complication, we suggest to avoid central venous line for hemodialysis as much as possible.

Making sure of the completion and patency of the palmar arch provide better protection to the hand and fingers.

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ماجد محمد العوامي

قسم الجراحة - كلية الطب - جامعة الملك فيصل

الدمام - المملكة العربية السعودية

المخلص :

الهدف : مراجعة لتجربة شخصية في عمل توصيلة شريان بوريد لإجراء الدهلزة في مستشفى تعليمي بشرق المملكة العربية السعودية.

الطريقة : مراجعة ملفات المرضى واستخرايم العمر والجنس والجنسية ونوع التوصيلة والجانب الذي اجريت به وكذلك نتائج العملية خلال ستة أسابيع من اجرائها.

النتائج : اجريت ٢٧٥ عملية متوالية إلى ٢٥٧ مريضاً من بينهم ١٥٤ ذكراً و ١٠٣ أنثى.

لقد كان بقاء التوصيلة تعمل بالطريقة المرغوبة بعد ستة أسابيع (وقت نضج التوصيلة) بنسبة ٩٣٪ . وكانت نسبة المضاعفات في هذه العملية هي ٨,٨٪ من المجموعة الكلي، بينما كانت المضاعفات ٢٨٪ حين اجراء التوصيلة في الكوع.

الاستنتاج : عملية برسكيا - سمينو لتوصيل الشريان بالوريد هي الخيار الأفضل لإجراء الغسيل الكلوي (الدهلزة).