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Original Research Article

Arteriovenous fistulas for hemodialysis in patients suffering from chronic renal failure: our experience as regards difficulties and complications

Gurinderjit Singh Nagi*, Jangpreet Singh Multani, Rajiv Arora

Department of Surgery, Punjab Institute of Medical Sciences, Garah Road, Jalandhar City-144006, Punjab, India

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***Correspondence:**
Dr. Gurinderjit Singh Nagi,
E-mail: nagigurinder@gmail.com

ABSTRACT

Background: The study was conducted to assess the various complications which are encountered while creating arteriovenous fistula and post operatively during the period when fistula matures. Also the study was intended to study the failure rate and the importance of physical examination to assess vessel caliber clinically.
Methods: The study comprised of 83 patients suffering from chonic renal failure and requied arteriovenous fistula for carrying out hemodialysis. The arteriovenous fistulas were created under local anesthesia, observing all precautions and end to side anastomosis was made after dissecting the vein and the artery.
Results: The most common difficulty encountered at surgery was when cephalic vein was of very small caliber and we had to give a small longitudinal incision in the wall of vein or do cheatle manouvre to make the anastomosis adequate. In five cases we started for radiocephalic fistula but had to convert to brachiocepphalic fistule as arteriovenous anstomoosis was not possible between the radial artery and the cephalic vein. There were no major complications except redness and inflamation in five cases and pus formation in one case. Inflamation subsided with higher antibiotics and pus had to be drained resulting in satisfactory recovery.Most of the fistulas started well with good thrill and by the end of one month 69 out 83 arteriovenous fistulas were functioning well with a patency rate of 83.13%.
Conclusions: There are no major complications after creating arteriovenous fistula and it is imperitive to do physical examination preoperatively to assess the vessel wall. In doubtful cases color Doppler may be got done for this. Postoperative precautions need to be observed for maturation of AV fistula.

Keywords: Arteriovenous fistula, Complications, Chronic renal failure, Hemodialysis, Patency

INTRODUCTION

Hemodialysis fistulas are surgically created communications between an artery and vein in an extremity.Several studies indicate that about 30% of hospitalizations are caused by construction and complications of vascular access.[1] Direct arteriovenous communications are called native arteriovenous fistulas. Prosthetic hemodialysis access arteriovenous grafts can also be used as a means of communication between an artery and vein. The access that is created is routinely used for hemodialysis. The AVF was first described and used as a reliable form of hemodialysis (HD) vascular access by Brescia et al in 1966.[2] A shift in the treatment of hemodialysis patients occurred when James EC et al noted that arteriovenous fistulas caused by trauma in Korean war veterans did not have significant effects on their health and this lead to his proposal that

arteriovenous fistula (AVF) would be an ideal solution for easy access to circulation in patients on hemodialysis.[3-5] Many of the patients benefitted from the development of prosthetic grafts when autogenous AVF were not feasible.[6-9] In mid-1980s, permanent catheters in internal jugular vein became a means of prolonging temporary access and increased in use.[10-12] Autogenous fistulas demonstrate higher patency and lower infection rates as well as fewer general complications than fistulas created with synthetic material.[13] Vascular access for hemodialysis should be suitable for repeated puncture and allow a fast blood flow rate for high efficiency dialysis with minimal complications. An ideal approach really does not exist.[14,15] A fistula should be placed atleast 6 months before the anticipated start of hemodialysis treatment.[16] Radiocephalic autogenous arteriovenous fistulas are the first choice for the vascular dialysis access.[2,17-20] This is because further fistulas can be created proximally if needed i.e. brachiocephalic/ brachiobasilic fistula and the risk of steal syndrome is reduced.[17,19,21,22]

METHODS

Our study comprised of 83 patients who underwent arteriovenous fistula creation. All these patients were already on dialysis for chronic renal failure .The duration of CKD as per patients' statement was more than three months. A detailed history of the patients was taken regarding hypertension and diabetes mellitus. Hemoglobin levels were estimated as also viral markers were tested. The hemoglobin level in all the patients was below 9 gm%. Four of the patients were found to be positive for HCV. And during surgery, in these HCV positive patients, all universal precautions were taken including using special kits for the surgeon and staff at the time of surgery.

Preoperatively physical examination was done in order to access the patency of the vessels. In six patients color-doppler study was also conducted to know the size of vessels and their patency. The arteriovenous fistulas were created either at near wrist (radiocephalic) or at elbow (brachiocephalic/ brachiobasilic). Local anaesthesia (inj. xylocaine 2%) was used in all cases and it was given by local infiltration. The vein and the artery were dissected with care being taken that vessel wall avoided the direct contact with cautery. The patient was then given 5000 international units of heparin intravenously and the vein was ligated distally.

Vein to artery anastomosis (end to side anastomosis) was done using 7'0' or 6 '0' monofilament prolene continuous suture. The clamps on the artery were removed and blood flow was restored. The functioning of arteriovenous fistula was assessed by feeling the thrill over the vein. After ensuring that there was no leakage the wound was closed. The patients were advised exercises to be started after 24 hours. Patients were also advised precautions like not getting BP checked on that side, not sleeping under that arm and no injection to be given on that side. Postoperatively amoxy-clave 625 tablet was given three times a day for one week and sutures were removed between 7 to 10 days.

Fistula patency and complications

In this study, out of a total of 83 cases 69 were functioning by the end of one month and 65 fistulas were functional after six months (Table 3). Primary patency at one year varies widely.[23-27] There were no major complications (Table 2) except in five cases in whom there was redness and cellulitis. For this, higher antibiotic cover was given and the cellulitis subdided. In one case there was pus collection which was derained after opening the skin wound and patient recovered but fistula kept functioning. Six patients complained of slight paraesthhesia on the medial aspect of thumb and in the operative region.

RESULTS

The study comprised of 83 patients who underwent the operation of AVF for the purpose of hemodialysis. The age of patients ranged between 9 and 85 years. Except one patient who was of 9 years of age and one who was of 18 years of age, rest all the patients were between the age of 25 and 85 years with majority of the patients that is 72 out of 83 between the age of 30 and 69 years (Table 1). Out of the total of 83 patients 69 were males and 14 were females (Table 1).

Table 1: Age wise incidence and sex ratio.

Age in years	Male patients	Female patients	Total patients
01 to 10	01	00	01
11 to 19	01	00	01
20 to 29	03	02	05
30 to 39	14	02	16
40 to 49	16	03	19
50 to 59	16	04	20
60 to 69	15	02	17
70 to 79	02	01	03
80 and above	01	00	01
Total	69	14	83

Table 2: Incidence of complications.

Complication	n=83	Percentage
Inflamation/redness	05	6.02
Pus formation	01	1.20
Mild paraesthesia	06	7.23

Table 3: Patency rate.

Patency after 1 month	69 out of 83	83.1%
Patency after 6 months	65 out of 83	78.3%

72 patients were operated first time while 11 came for creation of second fistula after the first fistula stopped working over a period of time. 63 fistulas were created between radial artery and cephalic vein and 20 were brachio-cephalic fistulas. The most common difficulty encountered at surgery was when cephalic vein was of very small caliber and we had to give a small longitudinal incision in the wall of vein or do cheatle manouvre to make the anastomosis adequate.

In five cases we started for radiocephalic fistula but had to convert to brachiocepphalic fistule as arteriovenous anstomoosis was not possible between the radial artery and the cephalic vein. There were no major complications except redness and inflamation in five cases and pus formation in one case. Inflamation subsided with higher antibiotics and pus had to be drained resulting in satisfactory recovery. Most of the fistulas started well with good thrill and by the end of one month 69 out 83 arteriovenous fistulas were functioning well with a patency rate of 83.13%.

DISCUSSION

The study comprised of 83 patients suffering from chronic renal failure who needed arteriovenous fistula for long term hemodialysis. Out of 83 patients 72 patients had come for arteriovenous fistula (AVF) creation for the first time with the disease duration between two to four months. Thirteen patients had come for creating a new fistula after the previous one had become non-functional over a period of time.

63 fistulas were created between radial artery and cephalic vein and twenty fistulas were created between brachial artery and cephalic vein. In five cases where we started to create radiocephalic arteriovenous fistula but had to abandon this and created a brachiocephalic fistula because the cephalic vein in forearm was very small and anastomosis was not possible. Preoperative physical examination was done to assess the vessel in all the cases and in six cases we also got color doppler study to assess the vessel.

Physical examination preoperatively and /or postoperatively has been shown to have a 70 to 80% success rate in predicting adequate AVF (28-30). Several studies demonstrated no significant association between vessel diameter and AVF primary failure.[31] K/DOQI (Kidney Disease Outcomes Quality Initiative) VA guidelines stated that AVF have excellent patency once established and lower complication rates where as one study stated that patency rate of PTFE grafts was better than that for endogenous fistulae.[21,32]

Vein size is considered important for patency and eventual functional fistula and studies have shown that cephalic veins of 2mm or less diameter have high failure rate and should not be considered for RC-AVF.[20,24,33-36]

CONCLUSION

The results of the study show that arteriovenous fistula (AVF) can be created safely with minimal complications and good results. In majority of the cases, physical examination is very important to assess the vessels. However color doppler can be advised in some cases where physical examination is inconclusive. Postoperative precautions like avoiding injection, BP measurement/keeping arm under the body and exercises must be followed .

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