

Vascular access for hemodialysis by microsurgery-Critical points to avoid failures

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Abstract

Chronic renal failure patients require hemodialysis for long periods. Surgical creation of vascular access over upper limb is a standard technique for the same. Successful vascular access require arterilization of superficial veins of upper limb also known as maturation of veins suitable to undergo hemodialysis. We discuss critical point which should be keep in mind while creating a Artery – Vein fistula as well as preoperative and postoperative care require to keep Vascular fistula patent for long time.

Key words: *Vascular access surgery, A-V fistula surgery, Chronic renal failure.*

Introduction

Literature reports creation of successful AV fistula in 1966 by Cimino et al (1). Many techniques for vascular access are reported in literature Such as external shunts, arteriovenous fistulae, prosthetic arteriovenous grafts, needle-less access devices, and tunneled central venous catheters. But the surgical created AV fistula remains the commonly performed vascular access procedure for hemodialysis.

Av fistula performed are Radiocephalic fistula, Brachiocephalic fistula and brachio basilic fistula.

We discuss certain critical points required for successful AV fistula in this paper.

Relevant vascular anatomy

At Wrist level-

Radial artery is superficial covered by fascia and skin lies between Flexor Carpi radialis and brachioradialis muscle. At around 1-1.5 cm distance lies cephalic vein which runs in subcutaneous level. At this level superficial radial nerve lies very close to cephaloc nerve. Both cephalic vein and radial artery run distally into the snuffbox where they are further close to each other

At cubital fossa level –

Brachial artery lies medial to biceps tendon, it is superficial at cubital level and is covered by biceps brachii aponeurosis distally where it divides into 2 branches 1 cm distal to cubital fossa.

Median nerve is in close relation to brachial artery it lies medial to artery. Also cephalic vein lies at the lateral end and basilic vein lies at the medial end of cubical fossa with numerous connections between them.

Preoperative points

Once the patient is referred for AV fistula creation. Standard Preanesthetic check up should be performed to establish that patient is fit to undergo procedure.

The procedure can be performed under local anesthesia or regional anesthesia .

Before procedure the entire upper limb venous mapping is done by applying a tourniquet at arm level and checking dilated veins over hand , forearm and arm level.

Any signs of thrombophlebitis or collapsed veins or presence of transmitted impulse on tapping over the course of vein indicates the venous system is not suitable for creation of fistula.

Doppler study can further support the examination, but we feel on clinical examination if good veins are seen then only fistula should be created.

Poor quality veins should be evaluated and a exercise regimen consisting of pressing objects like soft ball with hands will recover the veins by dilating them and making them suitable for fistula creation.

Figure 1

Cephalic vein mapping under tourniquet pressure ensuring good dilated veins



Intraoperative points

The course of radial artery and cephalic vein should be marked under tourniquet .

We perform entire procedure under magnification which gives good precision for dissection as well as anastomosis. After identification of vein and artery we perform end to side anastomosis of artery and vein using micro-sutures and micro instruments. The arteriotomy over the artery created is of same length as diameter of vein. 1 edge of the arteriotomy is cut with micro scissors ensuring patency of artery wall continuously when fistula is functioning.

The lie of cephalic vein is checked before performing anastomosis to avoid any twisting of vein which may lead to gradual failure of fistula.

Anastomosis is always performed under magnification ensuring precise bite taken from the vessel wall. After completion of anastomosis , palpable thrill should be present over the course of fistula vein . If thrill not present on palpation a bruit should be present on auscultation which will confirm the success on table.

Skin closure is done ensuring it is not tight closure and a very light dressing is given.

Figure 2
Marking of radial artery and cephalic vein



Figure 3
Radial artery and cephalic vein prepared for anastomosis using microinstruments



Figure 4

Completion of radio cephalic Av fistula anastomosis with dilated fistula vein



Figure 5

Completion of Brachio – cephalic Av fistula with dilated fistula vein



Postoperative points

Patient is advised to keep limb elevated for 2 weeks to avoid swelling of hand. Hand exercises of pressing objects are started immediately next day. Hemodialysis is avoided for 2-3 days to allow healing of surgical site and avoid bleeding through surgical site. In case hemodialysis is needed immediately after surgery it is given heparin free.

Once the fistula is arterialized after 4 weeks hemodialysis can be given . After every hemodialysis episode the fistula vein is massaged regularly to avoid thrombophlebitis as well as pressing objects is continued for long periods till the fistula is working.

Discussion

Radio cephalic Av fistula is considered as a gold standard for creating avfistula (2). It has minimum failure if done in patient with good quality veins. End to side Av fistula is better as there is no chance of steal phenomenon seen with side to side fistula.

Using microsutures and magnifications ensures precise bite taken from the vessel wall this reduces any technical chances of failure. Creating a arteriotomy and cutting 1 edge of artery wall ensures patency of arteriotomy throughout. Although anastomosis can be performed by any technique. Doing a back wall first technique avoids vein flipping and hence the vein wall trauma is also avoided .

Under magnification even a small caliber cephalic vein can be anastomosed with microsurgery technique. This avoids or reserves brachiocephalic fistula in first setting.

Postoperative care is very important for longterm use of created fistula . Massaging fistula vein and doing hand fisting exercises is very important to avoid any thrombophlebitic episode of fistula vein. Reccurent episode of thrombophlebitis will eventually lead to fistula failure requiring another fistula.

Conclusion

Radio cephalic Av fistula should always be preferred in first setting. Using microsurgery even small caliber cephalic vein can be used as a fistula vein. Preoperative vein assessment by clinically examination ensuring dilating cephalic vein avoids any chances of failure. Postoperative fistula vein care ensures long term fistula survival.

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None

References

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Conflict of interest

Declaration no financial interest or any conflict of interest exists