Radio-cephalic fistula for haemodialysis: Vascular surgical consideration
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Introduction
Vascular access may be defined as any technique that allows removal from &
delivery of fluids into the circulatory system at a rate of 200 ml/min or more for lengthy
interval.

In 1966 Brescia et al\(^1\) reported their experience with the radiocephalic
arteriovenous fistula constructed at the wrist. This procedure ensured the cephalic vein
would be kept distended even through blood was continuously & rapidly withdrawn from
the vein. The blood was then passed through the dialyser and returned to the proximal
segment of same arterialized vein or to another vein. The advantage of the Brescia-
Cimino fistula was the absence of perpetual defects in the skin through which infection
could more easily enter and the absence of implanted prosthetic materials. The
disadvantage was its common need for time to mature before use and therefore its
unsuitability for emergency use.

Justifications
There are many choices of devices as technique for achieving permanent internal
vascular access. The simplest one that offers reasonable success should be used\(^2\).

To select the best location for construction of an arteriovenous fistula for vascular access,
the surgeon must be sure that the vein to be used is adequate to promote success of the
fistula and that the arterial supply remaining as adequate to ensure satisfactory perfusion of
the limb. Often patients who need vascular access have had a chronic illness and have
required repeated phlebotomyintravenous infusions which may have caused thrombosis
of many superficial veins. The venous lumen must be patent at the anastomosis and
proximally. Careful clinical examination & duplex scanning can evaluate it. If necessary
phlebography can be used to determine the anatomy and examine the suspected area of
stenosis.

Figure: Radio-cephalic fistula

To ensure adequate arterial supply to the limb after construction of a fistula the surgeon
must make sure that the followings are fulfilled:

- An alternative arterial supply is available, i.e. in the upper extremity
  the Allen test should be negative.
- The artery is not interrupted i.e. a side to side anastomosis is constructed.
- The anastomosis should be made as peripheral as possible or if a more
  central location between larger vessels such as the brachial artery & cephalic
  vein is required. The anastomosis should be made small enough to avoid
  a steal syndrome.

Operative procedure

Incision: A transverse incision is made and proximal & distal skin flaps are developed to
allow exposure of adequate lengths of the vessels.

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Exposure: To expose the artery the deep fascia is incised longitudinally along the palpable radial pulse. Branches are tied with silk or cauterised and divided so that artery can be lifted from its bed.

Isolation of vessels: The vein is tied distally. Controlled proximally with a vascular clamp and divided just proximal to the ligature. The isolated segment is dilated gently with a clamp and irrigated with heparinised saline.

Arteriotomy: The artery is controlled with vascular clamps applied perpendicularly and is rotated medially to present the lateral aspect of the vessel for anastomosis. A longitudinal arteriotomy 2-3 times width of the lumen is made and flushed free of blood or clot with heparinised saline.

Anastomosis: The cephalic vein end is spatulated to fit the arteriotomy. The anastomosis is constructed with two running 6/0 or 7/0 monofilament polypropylene (prolene) sutures inserted at the proximal and distal vertices with the help of lateral & medial stay suture. Posterior anastomosis is constructed through the open anastomosis with the knots tied outside the vein should describe a gentle curve as it passes from the anastomosis to its native bed and should not be kinked or twisted.

Evaluation: When the vascular clamps are removed the vein is checked for filling and for a palpable thrill. Haemostasis is ascertained.

Wound closure: The wound is closed with a single row of continuous vertical mattress suture of 4/0 nylon or prolene. A loose dressing which is not circumferential is applied to the incision. The patient is advised to make ordinary use of the extremity, to avoid placing it in a dependent position and not to modify the dressing. In men with large vein this sort of fistula can be used for dialysis in 1-2 weeks. In women and children who tend to have small vessels, a period of maturation of several weeks or months may be desirable before every use without risk of loss of the fistula.

Complication
Complications of vascular access for hemodialysis:
- Infection
- Thrombosis
- Hemodynamic complication
- Intimal hyperplasia
- Aneurysm formation
Discussion
Hemodialysis has transformed the management of chronic renal insufficiency enormously. Patients who were once considered to die from renal failure are now routinely maintained on hemodialysis with quite reasonable lives. The population of dialysis patients is increasing at a rate of 10% per year. Dialysis access is now the most common vascular operation routinely done by vascular surgeons.

The subcutaneous autogenous fistula also called Brescia-Cimino fistula remains the long lasting and the most dependable type of long term vascular access. Studies have shown that it has 90% at 1 year & more than 75% at 4 years patency rate. Fistulas communication between the artery & vein dilates and hypertrophies the vein. This arterialization of veins, which takes 6 weeks to develop, is a sufficient access for hemodialysis. Brachiocephalic & Brachiobasilic arterio-venous fistulas are other types of secondary upper extremity vascular access.

References