Complications of Arteriovenous Fistulae

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Arteriovenous fistulae are frequently created for vascular access in the upper extremity. Although the incidence of serious complications has been infrequent minor problems are noted and have increased as access is sought more proximally in the limb. Spontaneous closure, especially in the early postoperative period, and particularly in women, often eludes explanation. Post transplant closure is even more of an enigma.

The classical side-to-side arterial venous (AV) connection is the prototype from which variations are possible. This type of connection establishes two circuits: 'parasitic' (proximal), and collateral (distal). A significant fistula exists when the opening between the artery and the vein is equal to the diameter of the proximal parent artery. Almost all communications between the radial artery and the cephalic vein are considered significant fistulae.

![Image](image_url)

Figure 1. Classic significant side-to-side fistula causing reversal of flow in artery and vein distal to the opening
Figure 2. The ulnar and radial arterial flow path of least resistance siphons blood from the fingers.

Figure 3. A 3 mm (End-Side) opening maintains thoroughfare flow and allows venous arterialisation.
The circulation around a significant fistula is characterised by
reversal of flow in the artery and vein distal to the communication. This
reversal sets the stage for two pathologic processes:

1. venous insufficiency characterised by swelling and bluish discolour-
ation of the parts distal to the fistula,

2. arterial insufficiency resulting in cold, pale, painful distal parts.

The classic significant fistula produces a combination of these processes
with the venous aspect being apparent objectively but with subjective symp-
toms of arterial insufficiency. A pure venous insufficiency can be obtained
by ligating the artery distal to the fistula and a pure arterial insufficiency
produced by ligating the vein distal to the fistula. The 'parasitic' circuit
(proximal) is always dominant, and the more distally a side-to-side fistula
is placed in the extremity, the greater the likelihood of satisfactory venous
arterialisation. Maximal flow in the proximal circuit can be obtained by an
end-to-end communication at the wrist without accompanying vascular in-
sufficiency syndromes. This is the type recommended. An end-to-side
veno-arterial communication at the wrist can produce a pure arterial in-
sufficiency (steal) in the hand (Figure 2).

The classical A-V fistula in the antecubital fossa or lower arm can
create vascular insufficiency syndromes, especially in the patient who has
had multiple prior vascular operations. The proximal or parasitic circuit
tsiphons the majority of the blood away from the distal circuit. Arterialisa-
tion of the veins in the arm is less satisfactory for access than in the forearm.
To obtain maximum venous arterialisation in the forearm with a high fistula
requires an end-to-side veno-arterial connection. Occasionally this will
create venous insufficiency in the forearm and the hand manifested by
swelling and discolouration (Figure 3). The swelling is often transient and
can be controlled by elevation and the use of external intermittent compression.

Arteriovenous interposed homo or autografts can cause venous insuffi-
ciency especially when a straight graft is used with the venous connection
distal in the forearm near the wrist. A straight brachial artery axillary vein
connection in the arm does not lead to insufficiency. An interposed loop
graft at the antecubital fossa with the arterial and venous connections at the
same level in the antecubital fossa, does not lead to distal venous insufficiency.

Many patients with arterial venous connections in the upper extremity
manifest some forms of vascular insufficiency of an insignificant degree.
These can be minimized by applying the rationale suggested by studying the
circulation around the classic A-V fistula.

The arterialised venous system is virtually an aneurysm, however
dominant 'venous' dilations may occur near the AV connection. Usually they
are of little consequence, but if the enlargement compromises blood supply
of skin, a reduction aneurysmectomy should be done.
REFERENCES


