CORRECTION OF STEAL SYNDROME OF NATIVE ARTERIOVENOUS FISTULAS IN HEMODIALYSIS PATIENTS BY “BANDING” TECHNIQUE

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SUMMARY

Objective: Among complications of native arteriovenous fistulas in hemodialysis patients, symptomatic steal syndrome is uncommon, but may lead to ischemia of the hand.

Materials and Methods: A retrospective review of the charts of 653 patients who underwent 826 direct upper extremity arteriovenous fistulas, and 6 of whom were subsequently diagnosed as steal syndrome, was performed between January 1998 and December 2002. Six patients with chronic renal insufficiency (4 male, 2 female) with patent upper extremity native arteriovenous fistulas presented with severe hand ischemia. All patients developed severe ischemic manifestations in the form of sensory loss in 2, severe intolerable pain with impalpable pulse in 3, and cyanosis of digits and ulcerations in 1. All patients underwent banding of the native arteriovenous fistulas.

Results: All patients had immediate resolution of upper extremity ischemia immediately after banding procedure. Limb salvage and maintenance of a functional fistula were achieved in 100% and 83.3%, respectively, at six-months.

Conclusions: We claim that the banding technique reduce fistula diameter and improve distal perfusion. This technique also has the advantage of saving veins which, of course, is worthwhile in patients under haemodialysis.

Key Words: Arteriovenous Fistula, Arterial Steal, Hemodialysis, Hand Ischemia, Banding Technique

Native AVF (Arterio-venous fistulas) provide the best possible vascular access for chronic hemodialysis. Compared with the prosthetic bridge graft, the AVF has better long-term patency and fewer complications, including a lower incidence of vascular steal syndrome (1).

Various surgical techniques to correct steal syndrome such as ligation of the AVF, narrowing of the angioaccess, elongation of the bridge or ligation of the artery distal to the AVF plus bypass have been described (2-4). If no hemodynamically significant inflow lesion exists,
the option for surgical technique include banding procedure to reduce AVF flow. This report presents our experience with banding technique in the six patients with chronic renal insufficiency with patent upper extremity native AVF presented with hand ischemia.

Materials and Methods

A retrospective review of the charts of 653 patients who underwent 826 direct upper extremity AVF, and who were subsequently diagnosed as steal syndrome, was performed at the Ankara Numune Education and Research Hospital between January 1998 and December 2002. The direct upper extremity AVF created included the following: snuff-box (n=278, 33.6%), radiocephalic (n=445, 53.8%), brachiocephalic (n=96, 11.6%), and brachio-basilic transposition (n=7, 0.8%). Hand ischemia occurred 6 (4 of brachio-cephalic and 2 of radiocephalic) of 826 direct upper extremity AVF (0.7%). The median age of these patients (4 male, 2 female) was 52.3 years (range 35-75 years). Two patients developed ischemic manifestations immediately postoperatively, 2 in the first month, 1 after 4 months, and 1 after 1 year. All patients developed severe ischemic manifestations in the form of sensory loss in 2, severe intolerable pain with impalpable pulse in 3, and cyanosis of digits and ulcerations in 1.

Diagnosis was mainly based on clinical features: regaining of distal pulses after AVF compression, confirmed by Duplex ultrasonography (USG) examination. Monophasic flow increased to biphasic and triphasic in three and one patients, respectively.

All six patients were treated with the banding technique under local anesthesia. By a three cm oblique incision, a right-angle clamp is gently placed around the vein, special care being taken not to perforate the arterialized vein. A Teflon tape is grasped in the clamp and passed around the vein. A 2/0 silk ligature is tied beneath the right-angle clamp constricting the Teflon tape thereby bringing the caliber of the AVF down to 1/2 or 1/3 of its size without losing thrill on the AVF and palpation of the distal pulses (Figure 1).

Figure 1: Banding technique involves constricting the Teflon tape (black arrow) thereby bringing the caliber of the AVF down to 1/2 or 1/3 of its size.
Results

All patients had immediate resolution of upper extremity ischemia immediately after banding procedure. Two patients became asymptomatic without restoration of a radial pulse. At 4 months postoperatively, one of the patient’s painful ischemic ulcerations recovered almost completely. One of them thrombosed three months after banding and its ischemic manifestations were completely resolved. Thrombectomy and graft extension to a more central vein restored patency. Limb salvage and maintenance of a functional fistula were achieved in 100% and 83.3%, respectively, at six-months.

Discussion

Hand ischemia is rare complication after construction of an native or prosthetic bridge graft AVF. The incidence of ischemia with prosthetic bridge graft AVF varies between 2.7 and 4.3% and the incidence of ischemia with native AVF is less than 2% (4,5). In our study the incidence of hand ischemia with direct upper extremity AVF is 0.7%.

Mild circulatory insufficiency presenting as hand claudication or pain during dialysis can usually be conservatively managed by observation or by restriction of dialysis flow rates. Nevertheless there are patients developed severe ischemic manifestations necessitating surgical revision (3,4). The classic maneuver to deal with the steal syndrome is the ligation of the AVF and performance of another procedure to gain dialysis access (6). Alternatively, many of the reported techniques for reducing AVF flow have been hampered by their complexity involve the destruction of functional angioaccess sites, and involve conversion of native AVFs to prosthetic bridge grafts (2-4). The main disadvantage of artery ligation-bypass procedures is the fact that they are more expensive than banding procedure and difficult to insert.

Another widely used technique is the so called banding. It consists of producing a stenosis in the outflow portion of the AVF, close to the anastomosis. Many variations of banding, all intended to produce a narrowing and consequent flow reduction, have been reported (6-8). The practical problem in banding technique stems from the difficulty in establishing the precise degree of stenosis required for elimination of the steal, while allowing a flow sufficient to sustain patency of the outflow fistula. The level of critical stenosis that results from the banding procedure is very important. Hemodynamic assessment is required during banding technique, but it may also be useful in pre- and intra-operative evaluation of patients undergoing therapeutical AVFs to prevent hand ischemia. Color-duplex USG is noninvasive, painless and reproducible in monitoring a vascular access. In addition, the blood flow volume measured by color-duplex USG correlates well with the blood flow of a vascular access (9). In our own experience, the amount of narrowing is determined easily in native AVFs with palpation the distal pulses and the thrill on the fistula and confirmed by Duplex USG measurement.

In conclusion, we claim that the banding technique reduce fistula diameter and improve distal perfusion. This technique also has the advantage of saving veins which, of course, is worthwhile in patients under haemodialysis.
REFERENCES