MANAGEMENT OF COMPLICATIONS OF ARTERIOVENOUS FISTULA FOR HEMODIALYSIS

Essay
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بسم الله الرحمن الرحيم
﴿ قالوا سبحانك لا علم لنا الا ما علمتنا
إنك انت العليم الحكيم ﴾
صدق الله العظيم
الآيه(32) سوره البقره

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List of abbreviations

AVF	ArterioVenous Fistula
AVG	ArterioVenous Graft
CVO	Central Venous Obstruction
DDAVP	1-Deamino -8- D –Arginine Vasopressin
DRIL	Distal Revascularization and Internal Ligation
ESRD	End Stage Renal Disease
GPS	Glycoprotiens
IMN	Ischemic Mononeuropathy
MT	Mechanical Thrombolysis
NKF	National Kidney Foundation
PAI	Proximalization of Arterial Inflow
PAVA	Proximal Arteriovenous Anastomosis
PMT	Percutaneous Mechanical Thrombectomy
PTA	Percutaneous Transluminal Angioplasty
PTD	Percutaneous Thrombectomy Device
PTFE	Polytetrafluoroethylene
PTVA	Percutaneous Transluminal Venous Angioplasty
RUDI	Revision Using Distal Inflow
SVC	Superior Vena Cava
TPA	Tissue Plasminogen Activator
VWF	Von Willebrand Factor

Introduction

The Surgical creation of anastamosis between an artery and a vein thus allowing arterial blood to flow through the vein. This causes venous engorgement and enlargement, allowing large bore needles to be inserted for haemodialysis.**(Allon M et al., 2011)**

The functional ability and patency of arteriovenous fistula have a major impact on survival and quality of life for the patients with chronic renal failure. Timely creation and meticulous maintenance of these 'lifeline' are crucial for the care of hemodialysis patients. According to National Kidney Foundation-Kidney Diseases Outcome.**(Bacchini et al., 2009)**

Because insufficient numbers of kidney donors and difficulties in achieving optimal hygienic conditions for peritoneal dialysis, performing arteriovenous fistulas for periodic haemodialysis has become the first choice of patients with chronic renal failure. The importance of vascular access for haemodialysis has increased because of the increasing number of patients surviving longer with chronic renal failure. **(Trivedi DD, 2011)**

Although the endogenous arteriovenous fistula usually provides satisfactory long term access for dialysis, complications may occur frequently. Complications associated with established vascular access sites or the inability to obtain suitable vascular access are important causes of morbidity and mortality in patients with end-stage renal disease. Early thrombosis and failure to mature are significant problems occurring in 20% to 50% of arteriovenous fistulas. **(Huijbregts et al., 2007)**

The most frequent complication leading to failure of the vascular access site is thrombosis.Therapeutic options of thrombosedarterio-venous graft include percutaneous or surgical thrombectomy, thrombolytic agents, and mechanical dissolution. The choice of technique to treat thrombosis should be based on the expertise of the center. If these modalities are successful, a graftogram can then be performed and detected stenoses treated with venoplasty or surgical revision. Failure to treat underlying stenosis will result in rapid repeat thrombosis . Infection is second but more acutely life threatening. **(Mark R et al., 2006)**

Many late complications such as thrombosis, venous hypertension, aneurysm, hemorrhage, vascular steal syndrome

and stenosis may occur following AVF surgery. These may cause dysfunction of the AVF and limit the efficiency of haemodialysis**. (Schutte WP et al., 2007)**

The development of ischaemic steal syndrome remains an important complication after creation of arteriovenous fistulas. Clinically significant distal extremity ischaemia occur in 1.6% to 8% with all individuals with functioning dialysis shunt. **(De Caprioet.al., 2003)**

False aneurysm may occur at anastmosis commonly at needling site which has been over used. The incidence of false aneurysm formation is 10% for PTFE grafts compared to 2% for autogenous AVFs. A venous hypertension syndrome may develop in which the hand distal to the fistula becomes swollen and uncomfortable with thickening of the skin and hyperpigmentation. **(Zibari et.al., 2004)**

According to National Kidney Foundation (NKF), 25% requires hospitalization for vascular access complications.Hospitalization rates for fistula complications are higher in patients with diabetes mellitus. **(Winsett OE.et al., 2001)**

Regular monitoring of the fistula is indicated, and fistula flow should be assessed in critical cases as the single most important predictor of fistula thrombosis. It must be the aim to prevent thrombosis rather than intervene on established thrombosis.One decade ago, Ultra-sonographgy and Duplex sonography started to be used as valuable tools for assessing an established fistula and also for preoperative assessment. **(Allon M, Robbin ML 2002)**

Treatment of any thrombotic or flow complication aims at a restoration of optimal flow conditions. Four decades of haemodialysis therapy have shown that prevention is the best therapy for complications.Adequate treatment of AV access dysfunction is a complex undertaking in which the interventional radiologist, vascular surgeon and nephrologist should cooperate with each other on a conjoint basis. **(Padberg JR et al., 2008)**

The best treatment of complications is prevention. Care of vascular access for haemodialysis therapy is enhanced by respecting few recommendations: careful preoperative diagnosis, preferably using ultrasonographic techniques, timely creation of vascular access during the predialysis period, continuous monitoring and surveillance of vascular

access by dialysis staff and nephrologists, early diagnosis of vascular access dysfunction aiming at elective repair of failing, not the failed access, absolute priority to native arteriovenous fistulas, restricted use of grafts, untunneled/tunneled catheters and other devices, there should be no competition between surgical and interventional techniques but they should be used according to local expertise and dedication, reduction of infectious and thrombotic complications by proper implantation techniques and adequate staff training, documentation of strategies and analysis of complications and results at quality control and quality improvement. **(Ronco and Levin 2004)**

Aim of the work

The aim of the work is to highlight management of vascular access (VA) complications in patients using an arteriovenous fistula (AVF) or an arteriovenous graft (AVG) for maintenance haemodialysis therapy.

Anatomy of veins of upper limb

Superficial veins commences as dorsal venous network of the hand which drains into lateral cephalic vein and dorsal basilic vein ***(Turmel-Rodrigues L et al., 2008)***.

Cephalic vein lies subcutaneously just behind the radial styloid, where it is very constant in position, runs up the anterior aspect of forearm, lies in groove along the lateral aspect of biceps in the upper arm, passes to the deltopectoral triangle, pierces the clavipectoral fascia to enter the axillary vein ***(Turmel-Rodrigues L et al., 2008)***.

Basilic vein runs along the posterromedial aspect of forearm, passes to the anterior aspect of the elbow on the medial side, runs in the groove along the medial border of biceps, pierces the deep fascia at the middle of the upper arm, where it joins venae comitantes of brachial artery, eventually forming axillary vein ***(Turmel-Rodrigues L et al., 2008)***.

Median cubital vein connects the cephalic and basilic vein, the veins at the elbow are separated from the underlying brachial artery by the tough bicipital aponeurosis ***(Turmel-Rodrigues L et al., 2008)***.

Creation of whatever autogenous, primary hemodialysis fistula usually requires a preoperative assessment of superficial veins that could be anastomosed for a convenient hemodialysis access. Clinical inspection is generally not sufficient to identify adequately sized vein for hemodialysis access fistula creation. Consequently, the role of preoperative imaging is to discriminate superficial veins that could be suitable for the creation of durable and functional hemodialysis fistula ***(Arnold Perry W 2002).***

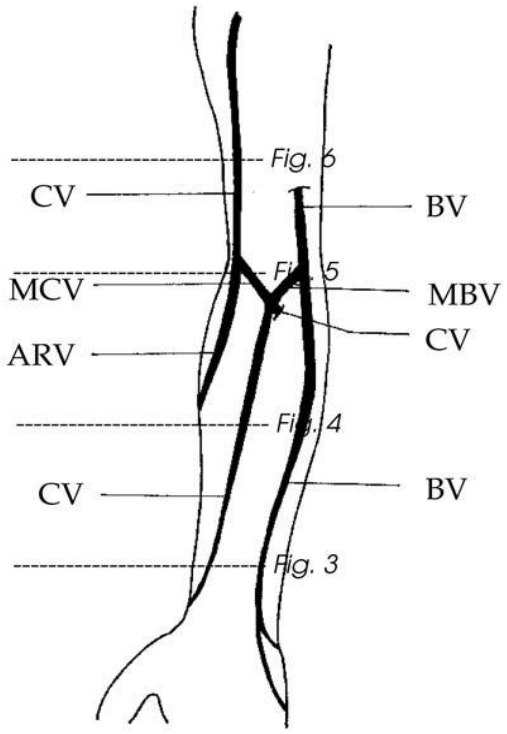

Fig.(1): The superficial upper limb veins available for hemodialysis access (anterior view of right upper limb in supine position) ***(Arnold Perry W 2002).***