Editorial

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Arteriovenous Fistula Stenosis and Percutaneous Transluminal Angioplasty: How, When and Why?

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Editorial

Vascular access (VA) complications occur frequently and contribute significantly to morbidity and hospitalization in chronic hemodialysis patients. Some of the common arteriovenous fistula (AVF) complications include lack to maturation, stenosis, and thrombosis.

The National Kidney Foundation Kidney Disease Outcomes Quality Initiative (K/DOQI) guidelines provide recommendations for preparing the largest number of native AVF due to more longevity and low infection rate. Moreover K/DOQI guidelines set both monitoring programs (clinical and instrumental) for the identification of potentially treatable causes and decision to intervene on a fistula. The frequency and the method of access surveillance are still a topic of ongoing controversy.

Evaluation criteria of malfunctional fistula include the use of clinical indicators: difficult insertion of needles, increased venous pressures, frequent and prolonged bleeding after dialysis, recirculation, KT/V inadequate, weak trill, lack of maturation, inadequate arterial inflow, and decreased flow rate by Duplex Doppler ultrasound (DDU).

DDU, in experienced hands, can identify the etiology of nonmaturation and dysfunction fistula. DDU has the advantage of directly visualizing early stenosis, high velocity of the peak systolic velocity (PSV), the relationship between the PSV at the site of stenosis and the speed detected in an adjacent segment of regular or non-stenotic caliber.

DDU also provides indirect signs of stenosis in terms of AVF flow reduction and of variations of the afferent artery Doppler spectrum typical of a circle of high downstream resistance, DDU is useful for monitoring endovascular treatment of dysfunctional vascular accesses in order to prevent fistula thrombosis.

Our experience confirms that a meticulous ultrasound examination, by studying the anastomosis, afferent arterial side, efferent venous side (distal/proximal) in hemodialysis patients, is very important tool for evaluation of a dysfunctional access.

We consider that AVF flow measurement as a method for documenting the low flow (<600 ml/min) of an AVF and high velocity of the peak systolic for the detection and grading of stenosis.

Stenosis is considered the primary cause of AVF dysfunction. The pathogenesis of venous stenosis is not fully understood and the pathophysiology underlying the occurrence of stenosis is complex.

The formation of stenosis initiates by endothelial cell injury which leads to smooth muscle proliferation and neointimal hyperplasia. Some factors may lead to endothelial injury: shear stress from turbulent blood flow, more venipuncture's and angioplasties.

Inflow (native arterial disease, anastomotic and juxtaanastomotic stenosis) and outflow (proximal venous stenosis or collateral veins) stenosis are treated by percutaneous transluminal angioplasty (PTA). The most common site for stenosis in fistula is at the juxta-anastomotic site and the outflow vein. PTA is the first-line treatment for AVF stenosis, but percutaneous procedure is contraindicated only in cases of local infection.

PTA is an efficacious method to electively correction of stenosis in order to maintain adequate vascular access as long as possible, prolonging fistula survival. PTA can be considered technically successful if the degree of residual stenosis is less than 30%.

Furthermore, in the last years, some studies were published on the use of DDU like a method of imaging of arteries and veins during intravascular procedures performed on VA.

The efficacy and safety of percutaneous ultrasound-guided procedure is similar to the fluoroscopy. However DDU does not provide the fistula panoramic view. Percutaneous ultrasound-guided procedure requires two physicians with a high level of US experience, the need for close coordination between the operator and assistant, since more than two hands are needed to perform the procedure.

Benefits associated with DDU include the following: no contrast media and no radiation, precise determination of puncture site making easier to conduct the procedure, precise fitting of balloon diameter to the diameter of the fistula and it is also less expensive.

This method may be particularly useful in patients in pre-dialysis period diagnosed with stenosis of vessels forming the fistula.

Complications arising from PTA are rare. In some studies the most common complication is immediate loss of access due to acute thrombosis, despite the intraoperative use of heparin followed by its infusion postoperatively.

Other complications include venous rupture during the procedure, formation of pseudoaneurysms, thrombosis and periprocedural bacteremia.

However, recurrent stenosis is very frequent and occurs in up to 60% and 70% of patients at 6 and 12 months, respectively. Multiple PTA procedures, however, are possible upon a single lesion in a fistula, thereby increasing AVF-life expectancy without extension of the fistula further up the arm. Routine clinical examination and surveillance of dialysis parameters are of great significance whenever there is a suspicion of restenosis and DDU must be performed. Age, presence of diabetes, length of stenosis is significant predictors for early restenosis.

DDU is currently used to evaluate pre-, intra- and post-operative patients for VA; it is useful in monitoring the PTA response and stenting by measuring the degree of residual stenosis.

We conclude that early diagnosis and treatment of AVF stenosis is important and the patency of dysfunctional AVF can be maintained safely with continuous monitoring. Efforts and collaboration between nephrologists, interventional radiologists, and surgeons are the key to maintaining and prolonging VA survival.