

# Evaluation of Percutaneous Coronary Angioplasty in Haemodialysis Fistula

**Ioannis Bountouris\***

Department of Vascular Surgery, General Hospital of Hellenic Air Force, Athens, Greece

**Corresponding author:** Ioannis Bountouris✉ [bountouris.ioannis@gmail.com](mailto:bountouris.ioannis@gmail.com)

Department of Vascular Surgery, General Hospital of Hellenic Air Force, Athens, Greece

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## Abstract

The number of dialysis patients is increasing every year. In this review, we will evaluate the role of Percutaneous Angioplasty (PTA) in relation to arterio venous fistula and graft potential. The main indication for PTA is > 50% stenosis or lumen obstruction of the arterio venous fistula and graft. It is usually performed under local anaesthesia. The infection rate is as low as the number of complications. Fistulas can be used for dialysis during the day without a central venous catheter. Primary ventilation > 50% in the first year while the main ventilation supported is 80-90% during the same period. The repeat PTA is as stable as the primary PTA. Early PTA carries the risk of requiring further intervention. Bubble cup can be used as a second line method. Stents and coated stents are retained to control complications and central venous stenosis with outflow. ATP is the treatment of choice for dialysis fistula stenosis or obstruction. Repeated ATP may be needed for better endurance. Drug elution balls may be the future of dialysis fistula ATP, but more trials are needed. Chronic Renal Failure (CRI) was defined as renal failure or Glomerular Filtration Rate (GFR) < 60 ml/min/1.73 m<sup>2</sup>, regardless of cause, for at least three months. Chronic renal failure is associated with adverse outcomes such as cardiovascular complications and premature death. The end stage of CKD is renal failure (GFR < 15 ml/min/1.73 m<sup>2</sup>).

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## Introduction

Common treatment modalities for patients with renal failure prior to kidney transplantation are Haemo Dialysis (HD) and Peritoneal Dialysis (PD). A vascular access site that can be an Arterio Venous Fistula (AVF), Arterio Venous Graft (AVG), or venous catheter is needed to apply HD. Arterio Venous (AV) fistulas are often the first choice for vascular access in people undergoing HD because they are more durable and reduce the risk of infection than AVG. If the U/S shows that the ships are not FAV-compliant, the FAV will be tested. Intravenous catheters are often used for access until an AVF or VGA is placed. Permanent venous catheters are the last resort when the patient has lost all possible positions for AVF or AVG. Newer hybrid grafts of the last decade, such as the Hemodialysis Trusted Flow (HeRO) graft (Merit Medical Systems, Inc., USA), are also used in cases of stenosis or obstruction central vein. A complication of AVF and AVG is significant stenosis (>50% lumen) or obstruction and is usually corrected with percutaneous

angioplasty (PTA) or surgery. In the present review, we summarize the role of ATP in restoring stability of narrow AVFs and AVGs [1, 2].

## Discussion

### Angioplasty, Yesterday and Today

Angioplasty for AVF stenosis was first reported in 1981. The technique ("Gruntzig balloon catheter") was feasible in three of the five patients in the study and had encouraging results. Since then, there have been many ATP-related advances on AVF and AVG. In recent years, several researchers have investigated the use of Drug-Coated Balloons (DEBs), which are drug-coated balloons (mainly paclitaxel) that can inhibit restenosis. These studies reflect the need to establish a method or material that can provide the best possible permeation with the fewest possible adverse effects on the vascular wall of AVF/AVG. In experimental animal studies, coating of perivascular AVGs with

paclitaxel, Nitric Oxide (NO) or dexamethasone was investigated for its anti-stenotic effect on grafts. The outer wall of the vessel (adventitia) is considered a source of endothelial cells and causes vasoconstriction. In another study, an injected polymer with anti-proliferative properties resulted in inhibition of the neo endothelial hyperplasia of pseudo-AV [3].

### Indication for Angioplasty at Vascular Access Sites

The basic indication for angioplasty of AVF or VGA in HD patients is when there is stenosis > 50% of lumen diameter with anterior wall thrombus, increased venous pressure vascularity during HD, exacerbated by laboratory findings such as hyperkalemia and uremia, decreased auscultation on auscultation, and ultimately decreased blood flow on site color Doppler [4].

### Technique

Most vascular access procedures are performed with the use of local anesthetics, but when central venous revascularization is required at the same time as angioplasty, angioplasty can be performed generalized anaesthesia. Angioplasty is usually performed before colour ultrasound to identify the narrowing area. In the case of acute obstruction, angioplasty is performed after thrombolysis and angiography of the area of interest [5].

Depending on the site of the stenosis, the insertion of the wire and the catheter is done in the direction or opposite of the direction of blood flow or both. There are three types of balloons that can be used in angioplasty: "standard", "high pressure" or "cut". Angioplasty is associated with the use of stents or stent grafts. When placing a stent or stent, the surgeon should take into account possible future stenosis and provide additional space for a new stent/stent procedure in the future. Self-expanding stents are preferred because they have less risk of migration. Their diameter should be at least 1-2 mm larger than the largest diameter of the ball. The results of angioplasty are directly checked by intraoperative angiography and can also be checked clinically after the procedure [6].

### Angioplasty versus Surgery

The choice of PTA or surgery to treat AVF/AVG stenosis depends on the experience of the vascular surgeon. However, many centers around the world report an increased amount of ATP compared with surgery. In all cases, the goal for both techniques should be 50% for initial ventilation during the first 6 month period. Angioplasty is a rapid intervention with a low risk of infection. No

permanent catheterization is necessary and HD can be performed the day after the intervention. In a retrospective study from 1987, the annual success rate for surgery was 19.3%, compared with 31.3% for angioplasty. However, many researchers believe in the superiority of surgical management by graft placement over ATP. There are fewer repetitions required with the surgical approach, but the primary durability of the two methods is the same. According to surgical approach is superior to ATP in the management of thrombosed AVFs, but the two approaches are equally effective in controlling thrombotic synthetic AVGs. In three studies, angioplasty was suggested as the method of choice in the management of AVF stenosis, while surgical approach was suggested in cases of ATP failure [7].

### Conclusion

Most studies report primary clearances after 6 months or even one year as 50%. However, angioplasty is required due to the inevitable hypertrophy of the vessel wall due to balloon use. In one study, repeated PTA resulted in 85% of assisted primary ventilation and surgery resulted in 91% of secondary patency, after one year. The durability of the new angioplasty was the same as that of the original angioplasty, a finding that contradicts the notion that surgery should be performed in cases of restenosis three months after angioplasty. Already and associates showed in their study that repeated PT resulted in a secondary clearance of 77.8% after two years [8].

Early angioplasty is thought to be prone to restenosis, increasing the number of repeat angiograms possible. Interestingly they showed that the age of the Brescia Cimino fistula at the time of the first angioplasty did not affect the outcome and that the most important predictors of future restenosis were the location of the stenosis and the existence of the stenosis within the anastomosis or in a vessel of small diameter. In another study, it was reported that stenosis longer than 2 cm was also a factor leading to restenosis after angioplasty. There are very few studies in the literature comparing balloons to stents. It is possible that the use of sharp balloons is associated with better permeability than standard ATP and high pressure balloons [9, 10].

### Acknowledgement

None

### Conflict of Interest

None

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