

## PROCEDURAL ANALYSIS OF PERIPHERAL ARTERIAL STENTING – 37 PATIENTS AT AFIC/NIHD RAWALPINDI

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### ABSTRACT

**Objective:** The objective of this study was to determine in hospital outcome of peripheral (excluding carotids and coarctation of aorta) arterial stenting at AFIC/ NIHD Rawalpindi by collecting and analyzing retrospective data from June 2007 to October 2011.

**Study Design:** Retrospective descriptive study.

**Patients and Methods:** We collected data from the medical records of 37 patients who underwent endovascular procedures for occlusive arterial diseases at AFIC/ NIHD Rawalpindi from June 2007 to October 2011. Selective angiography of patients was done, who were clinically suspected to have vascular occlusive disease. Details of vascular territories intervened were collected and facts about various types of wires, balloons and stents used for percutaneous interventions were gathered. Data was analyzed using SPSS version 17 and descriptive statistics were used to describe the results.

**Results:** Mean age of the patients was  $49.4 \pm 15.4$  years. Twenty five (67.5%) were males and 12 (32.5%) were females. Sixteen (43%) patients had endovascular interventions to renal arteries, 10 (27%) patients to subclavian arteries, 5 (13%) patients to iliac arteries, 4 (11%) patients to femoral arteries, one (3%) patient to popliteal artery and one (3%) patient underwent stenting to vertebral artery. Conventional wires, balloons and stents were used in most of the cases but provision of equipment was required in some cases. Biliary stents were deployed in 4 patients who required large stents. Strong muscles in lower limbs may crush or compress the stents. Either POBA (Plain Old Balloon Angioplasty) or larger self-expanding biliary stents were preferred in this set of patients, with over all good outcomes. No complication was observed in any patient during index hospitalization.

**Conclusion:** Percutaneous peripheral arterial intervention is a safe and effective modality of treatment. With availability of appropriate equipment and technical expertise, this form of management can benefit a large group of patients especially those who are considered high risk for surgery.

**Keywords:** Endovascular procedures, arterial occlusive diseases.

### INTRODUCTION

Vascular occlusive diseases are common, disabling maladies, and conventional treatment has always been medical management and, inevitably, surgical bypass. Endovascular procedures are fascinating alternative with low cost, excellent results but fewer complications<sup>1</sup>. In this era of "endovascular revolution," use of endovascular interventions for arterial occlusive lesions continues to increase. Although percutaneous interventions to coronary and carotid arteries are the most frequently performed procedures, interventions to other vessels such as: renal, subclavian, axillary,

brachial, iliac, femoral, popliteal and vertebral arteries; are becoming popular as they are less invasive with good outcome<sup>2</sup>. With the evolution of the technology, the results of these interventions continue to improve. Angioplasty is often associated with lower morbidity and mortality rates as compared to vascular surgery<sup>3</sup>. Furthermore, improved technology for detection and treatment of renal artery stenosis has been associated with an increase in renal artery interventions<sup>4</sup>. Renal artery stenosis is a major cause of renovascular hypertension and has been implicated in the decline of renal function<sup>5-6</sup>.

Endovascular stents and stent-grafts are now commonly deployed in the upper limb for a variety of conditions including: upper limb ischemia, subclavian artery aneurysms, and venous occlusion<sup>7</sup>. The subclavian vessels are prone to extrinsic compression (between the

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Received: 14 May 2012; Accepted: 21 June 2013

clavicle and the first rib) and flexion forces when the arm is abducted. Hence, vascular stents and stent-grafts placed in the lateral portion of these vessels may be subjected to unusual forces and risk of structural failure<sup>8</sup>.

There are various therapeutic options for the treatment of peripheral vascular disease of lower limbs. In the past, aortoiliac bypass surgery had been the mainstay of treatment for peripheral arterial diseases, but had high morbidity and mortality. However, nowadays, balloon angioplasty is an attractive and less invasive therapeutic option for aortoiliac insufficiency<sup>9</sup>. Likewise, percutaneous transluminal angioplasty (PTA) of the femoral, subclavian, and vertebral artery; is a technique that has been used for many years, especially for patients with high surgical risk<sup>10</sup>. The objective of this study was to determine in hospital outcome and procedural analysis of peripheral arterial stenting done at AFIC/ NIHD Rawalpindi.

## PATIENTS AND METHODS

This study was carried out retrospectively at Armed Forces Institute of Cardiology- National Institute of Heart Diseases (AFIC-NIHD) Rawalpindi. We collected the data from medical record of 37 patients who underwent peripheral arterial stenting for repair of atherosclerotic, traumatic or spontaneous vascular lesions. Patients with suspected vascular lesions were referred to this institute and definitive diagnosis was made by selective angiography. Roadmap and angiographic control were used for the exact placement of the stent-graft. Balloon expandable or self expandable stents were used in most patients, except four patients who had POBA. All patients were given a 5,000 IU heparin bolus before the procedure. Therapy after the procedure included: clopidogrel 75 mg/day for one month and acetylsalicylic acid 75 mg/day indefinitely. Immediate follow up included clinical assessment of all patients. In a few patients, where deemed essential, a Doppler study was done.

## Data analysis

Data was analyzed using SPSS version 17. Descriptive statistics were used to describe the data i.e. mean and standard deviation (SD) for quantitative variables, frequency and percentages for qualitative variables.

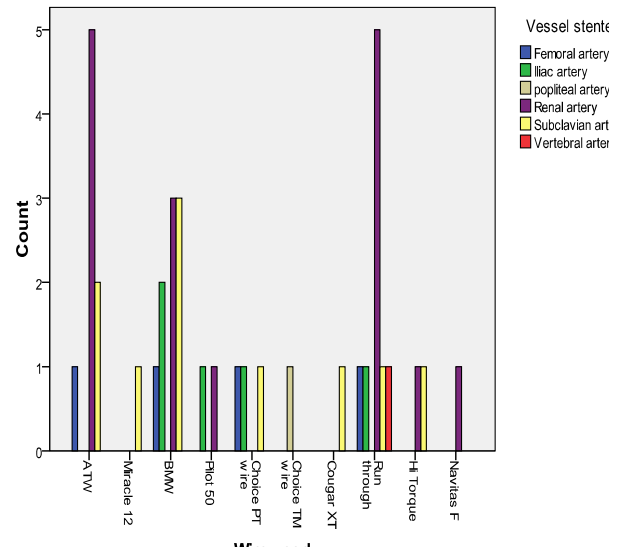


Figure -1: Wires used for percutaneous transluminal angioplasty (PTA).

## RESULTS

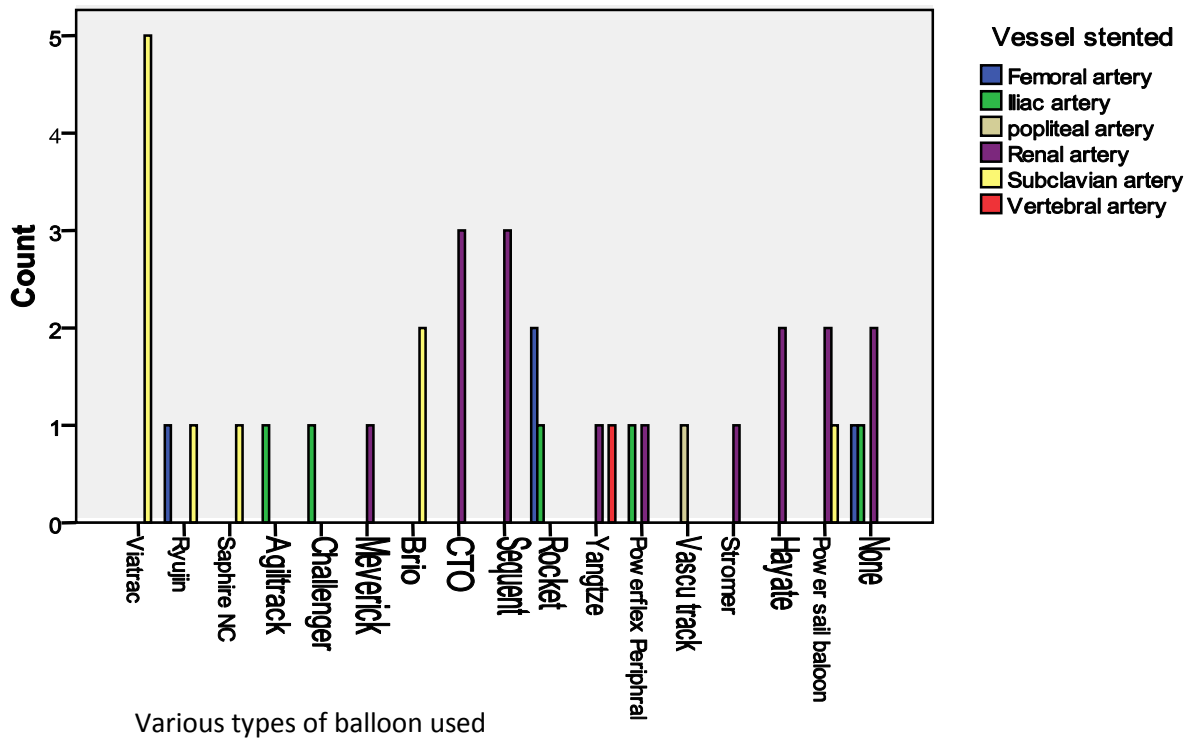
Mean age of the patients was  $49.4 \pm 15.4$  years. Twenty five (67.5%) were males and 12 (32.5%) were females. Sixteen (43%) patients had endovascular interventions to renal arteries, 10 (27%) patients to subclavian arteries, 5 (13%) patients to iliac arteries, 4 (11%) patients to femoral arteries, one (3%) patient to popliteal artery and one (3%) patient underwent stenting to vertebral artery.

We performed percutaneous transluminal renal angioplasty (PTRA) in sixteen patients. The diagnosis of renal artery stenosis was confirmed on renal arteriography and more than 50% occlusion was considered significant. Pre and post dilatation fractional flow reserve (FFR) was not carried out due to cost constraints.

The lesion was crossed with Run Through wires (Terumo) in five patients and in another five with ATW wires (Cordis Corporation). The BMW wires (Abbott) were used in three patients. Hi Torque Pilot 50 (Abbott), and Navitas F wires (B.Braun) were utilized in the remaining three patients.

Sequent (B.Braun) and NIC NANO 0.85 mm CTO Balloon (ASHAI) were used in a total of six patients. In another four patients Hayate balloon Pro 1.5 x 20 mm (Terumo, Tokyo, Japan) and

Balloon expandable MULTI-LINK VISION Coronary Stents (Abbott) were deployed in eight out of sixteen patients undergoing renal artery angioplasty. The MULTI-LINK ULTRA Coronary Stents (Abbott) were used in two patients and only POBA was done in another patient. Every one of remaining five patients had stenting with different type of stents including: Zeta (Abbott), Liberte (Boston Scientific), Coroflex blue (B. Braun), Genous (OrbusNeich) and Protégé self-expanded stents (ev3).



**Figure-2: Balloons used to dilate the lesion.**

Power Sail balloons (Guidant Corporation) were employed. One of the: Yangtze (Minvasys), Maverick (Boston Scientific), Powerflex peripheral (Cordis Corporation) and Stromer balloons (Medtronic); were used in another four patients. In the remaining two patients, stenting was done without pre-dilatation.

The other main group in our study comprised of ten patients who underwent angioplasty to subclavian arteries. The lesions were crossed with ATW wires (Cordis corporation) in three patients and BMW wires (Abbott) in two patients. One of the: Miracle 12 (ASAHI), Run through (Terumo), Choice PT

(Boston Scientific), Cougar XT (Medtronic) and Hi Torque Pilot-50 wires (Abbott); were used in other five patients. In five patients, Viatrac balloon (Abbott) was employed and in three patients, Brio balloons (Lee's Pharma) were used. One of the: Ryujin (Terumo), Sapphire NC (Orbus Neich) and Powersail balloon (Abbott); was used in other three patients. Balloon expandable coronary stents (Vision stent) were deployed in three patients and self expandable carotid stents (Acculink stent) were used in the other three. While, two patients required larger stents and biliary stents were improvised for them successfully with excellent results. Either of the Protégé self-expanded or Precise RX stents was

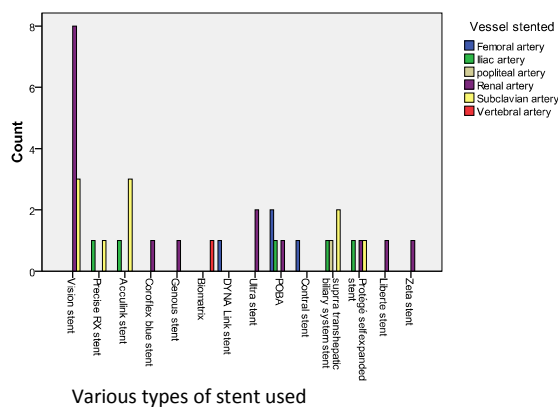
Scientific) was used in the other three patients. Lesions were crossed with one of the: BMW (Abbott), ATW (Cordis Corporation), Run-Through (Terumo) or Choice PT wires (Boston Scientific) in four patients undergoing endovascular procedures on femoral arteries. Choice TM wire (Boston Scientific) was employed for crossing of lesion in one patient undergoing stenting of popliteal artery.

Anyone of the following balloons was used for balloon dilatation of stenosis: Brio (Lee's Pharma), Rocket (Guidant Corp), Yangtze (Minvasys), Powerflex peripheral (Cordis Corporation), Sapphire NC balloons (Orbus Neich), Challenger balloon (Synexmed) was used for balloon dilatation of iliac or femoro-popliteal arteries.

After balloon dilatation, in two of the five patients with stenosis of iliac arteries, Precise RX (Cordis Corporation) and Acculink stents (Abbott) were used. Supra-Tranhepatic biliary stents (Cordis corporation) and Protégé self-expanded stents (ev3) were improvised for stenting of iliac arteries of two other patients who had long segment of stenosis. Only POBA was done in one patient who had involvement of aortic bifurcation, in addition to long segment of disease in iliac artery. DYNA Link (Abbott) and Control stents (Cordis Corporation) were deployed in two of four patients with focal femoral artery stenosis. Only POBA was done, in two patients with long segment of disease in femoral arteries, due to very strong muscles in lower limbs that may crush or compress the stents.

## DISCUSSION

The traditional treatment of arterial stenosis, vascular aneurysms, arterial ruptures, and perforations is surgical intervention; however, minimally invasive endovascular procedures have emerged as the preferred choice in the treatment of arterial occlusive diseases<sup>11</sup>. These procedures can be done under local anesthesia, are well tolerated with shorter hospitalization time while, surgical complications such as



**Figure-3: Therapeutic intervention performed or stents used for the lesion.**

used in two patients.

Historically patients of peripheral vascular disease present to surgeon with claudication or symptoms of limb ischemia and surgery was considered the mainstay of their treatment. Patients considered high risk for aorto-iliac bypass or surgery on femoro-popliteal vessels were referred for endovascular procedures.

In two of the five patients undergoing angioplasty of iliac arteries, BMW wires (Abbott) were used and one of the: Pilot-50 (Abbott), Run-through (Terumo) or Choice PT wire (Boston

hemorrhage and infection and the risk of general anesthesia can be avoided<sup>12</sup>. However endovascular therapeutic approaches have their own complications such as: stent occlusion, stent deformation and kinking, the loss of vessel branches on stent placement and intimal hyperplasia<sup>13</sup>.

### Bottom of Form

We performed percutaneous transluminal renal angioplasty (PTRA) in 16 hypertensive patients who were confirmed to have more than 50% stenosis of renal vessels. We frequently improvised coronary wires, balloons and stents for renal arteries stenting. Percutaneous transluminal renal angioplasty (PTRA) was introduced as an alternative to surgery by Gruentzig in 1978<sup>14</sup>. Until the early 1990's, surgical renal artery revascularization was primarily performed for renal artery stenosis. In 1993, secondary patency, reduction in blood pressure and improvement in renal function were found to be similar with surgery or PTRA<sup>15</sup>. PTRA was associated with a decreased number of complications. Although we don't have long term follow-up of patients undergoing percutaneous transluminal renal angioplasty, the effect of renal artery angioplasty on renal function was elegantly demonstrated by La Batide-Alanore in 2001, and revealed that renal function of the treated kidney was found to improve significantly after PTRA<sup>16</sup>.

We performed percutaneous interventions in ten patients with subclavian artery stenosis, five patients with iliac vessels stenosis, four patients with femoral artery disease and one patient with popliteal stenosis. The usual symptoms requiring PTA are: claudication that limits lifestyle, pain at rest, ischemic ulcers and slow healing wounds. We used Balloon expandable coronary stents and self expandable carotid stents with almost equal frequency in peripheral vessel. Suprathoracic biliary stents were improvised in four patients who had long segments of disease in large sized arteries. Only POBA was performed in four patients: two patients with femoral, one patient

with iliac and another with renal artery stenosis. POBA in femoral arteries was done, where lesion was involving the vessel covered with strong muscles as it may lead to strut fractures, deformation and crushing of the stents. In case of iliac and renal arteries, POBA was done if stent placement was not feasible due to technical reasons. We had excellent periprocedure results without any significant complication. Percutaneous revascularization of the common iliac arteries and external iliac arteries using percutaneous transluminal angioplasty (PTA) with or without stents is a well-established, minimally invasive technique and has superseded aortofemoral bypass for the majority of patients who have symptomatic iliac atherosclerosis<sup>17</sup>. The advantages of PTA associated with stenting include the low morbidity and mortality rate, shorter hospitalization time, preservation of the saphenous vein for future cardiac or limb surgical bypass operation, and reduced costs<sup>18</sup>. Many patients with peripheral vascular disease also have an associated cerebrovascular and coronary disorder, and thus an increased risk factor for general anesthetics and major surgery<sup>19</sup>

### CONCLUSION

Percutaneous peripheral arterial intervention is an effective and safe modality of treatment. With availability of appropriate equipment and technical expertise this form of management can benefit a large group of patients especially those who are considered high risk for surgery.

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