

## Interventional Nephrology: a new subspecialty of Nephrology

Efstratiadis G<sup>1</sup>, Platsas I<sup>1</sup>, Koukoudis P<sup>1</sup>, Vergoulas G<sup>2</sup>

<sup>1</sup>Nephrology Department, Aristotle University of Thessaloniki, Hippokratio Hospital

<sup>2</sup>Organ Transplant Unit, Aristotle University of Thessaloniki, Hippokratio Hospital

### Abstract

Interventional Nephrology is a new and emerging subspecialty of Nephrology that mainly deals with ultrasonography of kidneys and ultrasound-guided renal biopsy, insertion of peritoneal dialysis catheters, tunneled dialysis catheters as a vascular access for patients undergoing hemodialysis as well as percutaneous endovascular procedures performed to manage dysfunction of arteriovenous fistulas or grafts in end stage renal disease patients.

Traditionally, these procedures have been delegated to a variety of specialists with resultant delays in diagnosis and initiation of therapy. To avoid the delays nephrologists have taken the initiative to perform these procedures themselves. Indeed, recent data have emphasized that nephrologists can safely and successfully perform these procedures with excellent results.

The success of nephrologist's role in Interventional Nephrology insures the ideal management of renal patients with effectiveness, safety and lower cost for Public Health System. Certainly nephrologists must have adequate training and develop the necessary skills in the new fields as a prerequisite for the success of the concept. *Hippokratia* 2007; 11 (1):22-24

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**Corresponding author:** Efstratiadis G, Ethnikis Amyntis 14, Thessaloniki, 54621, Greece

Nephrology as a clinical specialty has the unique ability to give the opportunity of life to its patients even though their kidneys are entirely damaged. Indeed, end stage renal disease (ESRD) patients can live by means of renal replacement therapy (RRT), although the quality of this life is not without problems, due mainly to cardiovascular and bone disorders. Technological progress and optimal performance of RRT (Hemodialysis and Peritoneal Dialysis) as well as renal transplantation already offer new perspectives and essential improvement in this field of medicine.

Hemodialysis (HD) was born when Scribner performed his shunt in early 1960's (Figure 1), but unfortunately the method was abandoned because this shunt



**Figure 1.** *The Scribner's shunt*

was prone to serious complications with unacceptable morbidity and mortality due mainly to infections and thromboses<sup>1</sup>. Five years later, Brescia and Cimino introduced their technique of creating arteriovenous anastomosis (fistula) helping HD to be established as an excellent method for RRT<sup>2</sup>. According to Greek Registry of 2002, 7,700 ESRD patients are under RRT (7,000 with HD and 700 with PD) whereas 1,500 live with a renal transplant.

Interventional Nephrology (IN) is a new and emerging subspecialty of Nephrology that mainly deals with:

- i. Ultrasonography of kidneys and ultrasound-guided renal biopsy.
- ii. Insertion of peritoneal dialysis catheters (PDC) in ESRD patients
- iii. Insertion of tunneled dialysis catheters (TDC) as a vascular access for patients undergoing hemodialysis and

- iv. Percutaneous endovascular procedures performed to manage dysfunction of arteriovenous fistulas or grafts in ESRD patients<sup>3</sup>.

Traditionally, these procedures have been delegated to a variety of specialists with resultant delays in diagnosis and initiation of therapy. To avoid the delays nephrologists have taken the initiative to perform these procedures themselves. Because of their unique perspective on dialysis, these specialists are ideally suited to perform this activity. Indeed, recent data have emphasized that nephrologists can safely and successfully perform these procedures with excellent results<sup>4,5</sup>.

The goal of performing procedures by nephrologists is the effective and timeless anticipating of clinical problems affecting renal patients by physicians working closer to and knowing better the situation, the personality and the needs of these patients. The success of this goal insures the ideal management of renal patients with effectiveness, safety and lower cost for Public Health System. Certainly nephrologists must have adequate training and develop the necessary skills in the new fields as a prerequisite for the success of the concept.

### Renal ultrasonography

Renal ultrasonography by the nephrologist was popularized by O'Neill in the 1990's. He reported that diagnostic information and quick initiation of therapy was easily established when a nephrologist was involved<sup>6</sup>. Recent data from an Academic Center of USA have shown significant reduction of time required to perform a renal ultrasound on an outpatient basis from a mean  $46.5 \pm 2.4$  (SE) to  $4.7 \pm 0.7$  (SE) days when the procedure was performed by the division of nephrology<sup>4</sup>. Similar delays for the performance of a renal ultrasound on an outpatient basis are usual in the Hospitals of Thessaloniki. Nephrologists should be trained adequately in radiology laboratories with ultrasound imaging technic where they can practice ultrasonography of kidneys or ultrasound-guided renal biopsies. The key for the successful interpretation of renal ultrasonography is the correlation with the patient's clinical problems. Therefore, the nephrologist is best suited to interpret the findings of renal ultrasonography<sup>7,8</sup>.

### Insertion of Peritoneal Dialysis catheters

Peritoneal Dialysis (PD) as a method of RRT has many important advantages; preservation of residual renal function, improved middle molecule clearance, improved fluid and blood pressure control, reduced incidence of left ventricular hypertrophy, less likelihood of severe cardiac arrhythmias and better quality of life<sup>9</sup>. However, only approximately 10% of ESRD patients finally choose PD, although originally 50% seemed to accept the method<sup>10</sup>. The reduced utilization of PD is mainly attributed to the delayed insertion of peritoneal catheter by surgeons. For this reason the insertion of PD by nephrologists is essential<sup>11</sup>.

The procedure can be accomplished by three techniques; the surgical, the blind or modified Seldinger and the peritoneoscopic technique. The first one is performed by surgeons under general anesthesia whereas the last one is performed more frequently by nephrologists under local anesthesia using a small peritoneoscope (2.2 mm)<sup>11</sup>. The peritoneoscopic technique is associated with lower incidence of complications and offers the unique possibility of direct visualization of abdomen where the PD is placed<sup>11</sup>.

### Insertion of Tunneled Dialysis Catheters

There are three types of vascular accesses.

A tunneled cuffed dialysis catheter,  
An arteriovenous fistula (AVF) (Figure 2) and  
An arteriovenous graft (AVG)

The TDCs are placed usually temporarily until the creation of an AVF or AVG. However, in USA 27% of ESRD patients under hemodialysis use TDCs as their permanent access<sup>12</sup>. The TDCs are placed permanently only when other procedures fail. In a multi-centered study in Thessaloniki, we found that among a total number of 441 patients, 67 (15.2%) used tunneled dialysis catheters and 374 (84.8%) used AVF or AVG (unpublished data).

Traditionally, TDCs used to be placed by surgeons and radiologists. Recently, nephrologists have begun to perform this procedure safely and successfully. They also are involved in undertaking catheter exchange, removal and repairing their function with the utilization of angioplasty balloon catheters when TDC are occluded because of fibroepithelial sheath<sup>13</sup>.

### Percutaneous endovascular procedures

AVFs as well as AVGs are often complicated by stenosis. Commonly the problem appears in AVGs. Although stenosis can occur anywhere within the dialysis access, the most common point of stenosis (60%) is venous anastomosis<sup>14</sup>. The cause of stenosis is multifactorial but it is mainly attributed to neointimal hyperplasia. If stenosis is more than 50% it should be treated by percutaneous angioplasty balloon. The method is successfully performed by trained nephrologists with effectiveness and safety<sup>14</sup>.

A significant number of AVFs (10-25%) do not adequately develop and fail to sustain dialysis therapy<sup>14</sup>. This is referred to as early failure<sup>15</sup>. These AVFs were abandoned until recently when Beathard showed that most of the early failing fistulas did not mature because of stenosis in venous channel or because of a secondary vein which takes blood out of AVF<sup>15</sup>. Treatment of stenosis with percutaneous angioplasty balloon and obliteration of the secondary vein by a nephrology team in a multi-centered prospective study showed very satisfactory results<sup>15</sup>.

Thrombosis of vascular access, which in the vast



Figure 2. The arteriovenous fistula

majority of cases is caused by stenosis, is also being successfully performed by nephrologists either by mechanical or pharmaco-mechanical thrombolysis on an outpatient basis. Since, stenosis is the main cause of thrombosis, it is necessary to check the vascular access periodically for early detection of stenosis in order to prevent thrombosis<sup>16-18</sup>.

In conclusion patients with kidney disease and particularly those undergoing RRT need frequent interventional procedures. Interventional Nephrology is an emerging subspecialty of nephrology which provides the opportunity to nephrologists to undergo training in this area to develop the procedural skills to perform interventions to optimize the care of their patients. Nephrology training programs must take the initiative to promote the development of such training programs.

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