

*Original article*

## Permanent Vascular Access for Hemodialysis in Elderly Patients - Single Center Experience

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### Abstract

**Introduction.** It is estimated that patients aged  $\geq 75$  represent 20% of the prevalent population on hemodialysis. Even though arterio-venous fistula is widely regarded as the best option for permanent vascular access for hemodialysis, the situation with the elderly population on hemodialysis is a bit more complicated. This study aimed to present the type of permanent vascular access for hemodialysis in these patients created in the last year in our center.

**Methods.** During the last 12 months in 86 patients aged  $\geq 75$ , various type of permanent vascular access for hemodialysis was created. Data about the gender, age, comorbidity condition and the type of vascular access was collected from the medical records.

**Results.** The majority of our patients were male (61%), mean age was 79.2 years. The main permanent vascular access created for hemodialysis was arterio-venous fistula in 49 (57.6%), followed by tunneled cuff catheters in 20 (23.5%) patients, 1 patient had arterio-venous graft, and 16(17.6%) patients had non-tunneled central venous catheter as permanent vascular access for hemodialysis. The main reason for using tunneled and nontunneled catheters were thrombosis, non-maturation of the fistula and poor general condition with low life expectancy, respectively. Forty-five patients (53%) had started hemodialysis in the last year, and in 50 patients (58.8%) the current permanent vascular access was their primary access. The same pattern was seen in the subgroup of patients older than 80 years.

**Conclusion.** Arterio-venous fistula is the best option for permanent vascular access regardless of the age of the patients. When the conditions are not favorable, such as thrombosis, non-maturation and especially very poor general condition with short life expectancy tunneled cuff catheters and even non-tunneled central venous catheters can be seen as a viable option.

**Keywords:** vascular access, hemodialysis, elderly patients, single center experience

### Introduction

The incident hemodialysis population is ageing, and it is estimated that patients aged  $\geq 75$  represent 20% of the prevalent population on hemodialysis (HD) [1]. Usually, age above 65 is regarded as an elderly population, but since so many patients are older than 75 years, we decided to use this frame for elderly patients. This population is burdened with a lot of severe comorbidities, so all types of vascular accesses for HD are problematic. Even though arterio-venous fistula (AVF) is widely regarded as a best option for permanent vascular access for hemodialysis, the situation with the elderly population on hemodialysis is a bit more complicated. In the literature several studies are currently dealing with this problem [2-5]. Atherosclerosis and previous vascular damage lead to thrombosis or non-maturation of AVF, which itself can cause or worsen cardiac ischemia and heart failure. Arteriovenous grafts (AVG) require more procedures to maintain patency, on the other hand, fistulas require more procedures for establishing patency, and so overall patency may not differ substantially between the two forms of permanent access [6]. This may be especially important in older adults because of their more limited life expectancy and increased risk of failed fistula maturation [7, 8]. Sometimes, the maturation period for AVF exceeds the lifespan of the patient, so having this fistula presents no benefit for the patient. Some authors question the implementation of the Fistula First Initiative in elderly [8, 9] and some even recommend modifying the guidelines in this population [10]. Vascular access planning in the elderly is different from that in younger patients, and the Fistula First Initiative may not be the preferred approach for older patients because of their reduced life expectancy and conflicting results after surgery [11].

Central venous catheter (CVC), with its known complications, such as increased infections, pose risks of its own, although there are reports that there is a lower

risk for catheter related bloodstream infections in this population, compared to the younger patients, so in some situations, they may represent a suitable option for HD in settings of non-maturing AVF or poorly functioning synthetic grafts [12].

**Material and methods**

Observational retrospective study was conducted in which we evaluated the prevalent type of permanent vascular access in elderly patients created in our center from December 2018 up to November 2019. Baseline population included all patients who were ≥75 years and were presented for creating permanent vascular access. A subgroup of older elderly patients, aged ≥80 years was created.

Major comorbidities (diabetes, arterial hypertension, acute myocardial infarction, coronary revascularization, malignancy) were identified using prior patient medical history. After a thorough examination of the general condition of the patient, present comorbid diseases, physical and ultrasound Doppler examination of the arm, the decision was made for the type of permanent vascular access to be created.

**Results**

In 86 patients aged ≥75 years, mean age 79.2 years, 60% of which were male, permanent vascular access was created. Nephroangiosclerosis was found in 34 patients as the leading cause for chronic kidney disease, followed by diabetic nephropathy in 18 patients, multiple myeloma in 6 patients, 3 patients had obstructive nephropathy due to malignancy and 25 patients were evaluated with an unknown diagnosis. Characteristics of the patients studied are presented on Table 1.

The arteriovenous fistula was created in 49 patients (57.6%), 20 patients (23.5%) had inserted tunneled cuff catheters (TCC), 1 patient (1.2%) had AVG, and 16 patients (17.6%) had inserted non-tunneled CVC as permanent vascular access for hemodialysis (Figure 1).

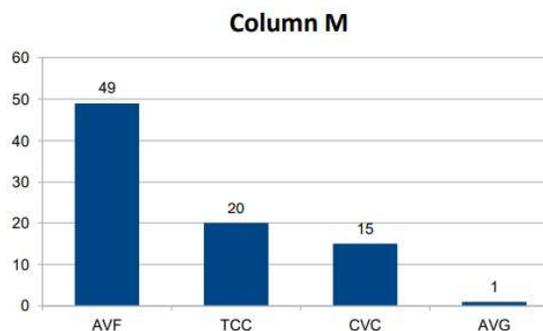
Forty-five patients (53%) were incident patients, 28 (52.2%) of them had AVF as permanent vascular access, 4 (8.8%) TCC and 13 (28.8%) non-tunneled catheters. In 50 patients (58.8%) the current permanent vascular access was their primary access.

The main reason for using tunneled catheters was thrombosis or non-maturation of the AVF. This was seen in ten patients, followed by the general bad condition in four patients. The arterio-venous graft was placed only in one patient who had multiple previous AVF. Non-tunneled CVC as permanent access for hemodialysis was used for patients with the poor general condition, mostly with the terminal malignant disease with short life expectancy, but also with heart failure (Figure 2). The same pattern was seen when we evaluated the pa-

tients older than 80 years. From 36 patients, 63.8% were male, and the most used permanent vascular access was AVF (50%), followed by CVC in 10(27.7%) and TCC in 8 patients (22.2%) (Figure 3).

**Table 1.** Characteristics of the study cohort

Baseline characteristics	Patients ≥75 years	Patients ≥80 years
Age, median	79.2	82.7
Male, n (%)	52 (60)	21 (63,8)
Comorbidities, n (%)		
Nephroangiosclerosis	34 (29,2)	12 (33,3)
Diabetes mellitus	18 (15,5)	7 (19,4)
Multiple myeloma	6 (5,2)	3 (8,3)
Obstructive nephropathy	3 (2,6)	
Unspecified	25 (21,5)	14 (38,9)
Type of permanent vascular access, n (%)		
Overall	86	36
AVF	49 (57,6)	18 (50)
TCC	20 (23,5)	8 (22,2)
CVC	16 (17,6)	10 (27,8)
VG	1 (1,2)	
Main reason for not using AVF, n (%)		
Thrombosis/non-maturation	15 (40,5)	5 (27,8)
Heart failure	7 (18,9)	5 (27,8)
Poor general condition	13 (35,1)	7 (38,9)
Haemostatic disorders	1 (2,7)	1 (5,6)
Arteria brachialis rupture	1 (2,7)	
Patients starting HD		
Overall, n (%)	45 (53%)	16 (44,4)
AVF	28 (62,2)	7 (43,3)
TCC	4 (8,9)	1 (6,2)
CVC	13 (28,9)	8 (50)
Primary permanent vascular access		
Overall, n (%)	50 (58,8)	20 (55,5)
AVF	35 (70)	12 (60)
TCC	5 (10)	2 (10)
CVC	10 (20)	6 (30)



**Fig. 1.** Type of permanent vascular access in elderly patients

The reasons for using CVC and TCC were the same as described above, poor general condition and thrombosis/non-maturation of the AVF, respectively (Figure 4). Sixteen patients (44.4%) were incident patients, and for 20 patients (55.5%) this was their primary permanent vascular access for hemodialysis.

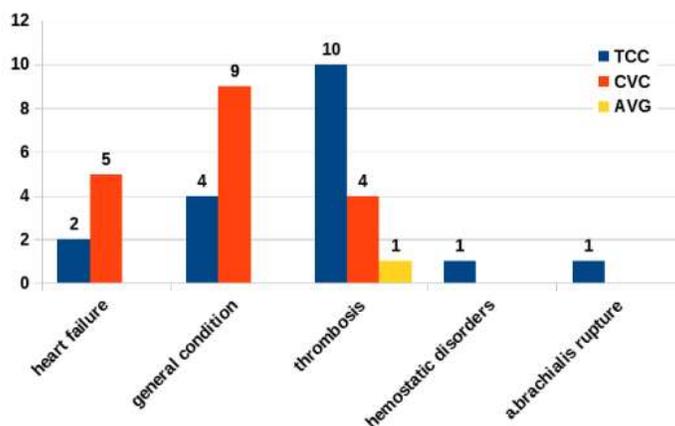


Fig. 2. Main reasons for not having AVF

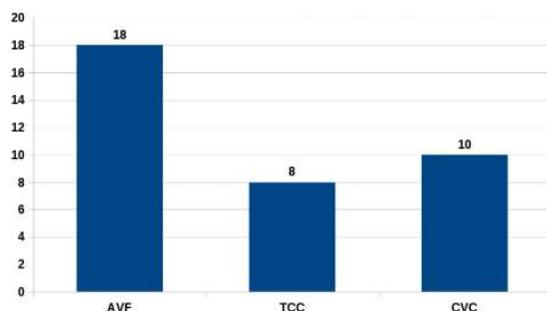


Fig. 3. Permanent vascular access in patients >80 years

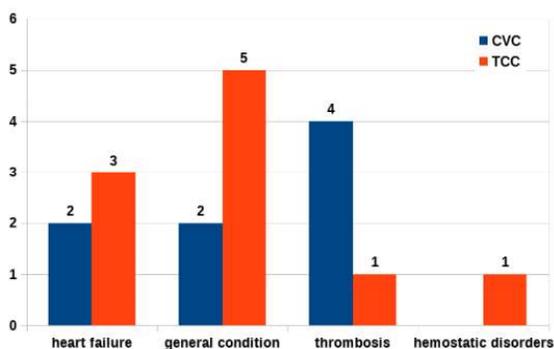


Fig. 4. Main reasons for not having AVF in patients >80 years

## Discussion

Every year, the number of elderly patients with chronic kidney disease in need of chronic hemodialysis rises. This study was aimed in presenting the prevalent number of elderly patients with CKD requiring permanent vascular access for hemodialysis in our country. Our center is responsible for care for about 85-90% of all vascular accesses for hemodialysis in R. North Macedonia. From roughly 1500 patients on hemodialysis in R. North Macedonia, 85 elderly patients aged  $\geq 75$  years (5.6%) needed permanent vascular access last

year. Although various societies' guidelines do not differ between the young and older patients in recommen-

ding AVF as a best choice for permanent vascular access for HD, the situation with the elderly patients is not that simple.

These are patients with many comorbid conditions, poor general condition and poor life expectancy. General poor condition with low life expectancy was the main reason for using TCC and CVC in these patients. There is only one patient with AVG because in our institution we do not insert AV graft. Our vascular surgeons are responsible for vascular grafts, although, generally speaking, the stance in Macedonia regarding vascular grafts is not very favorable. The only AVG inserted in our clinic was done with the help of a vascular surgeon.

The decision which type of access for which the patient relies not just on the blood vessels, but also on the presence of various comorbid conditions and general condition of the patient. The same observations were found in two similar publications. Both Brown *et al.*, [13] and Quinn *et al.*, [14] came to conclusion that difference in mortality between patients with different permanent vascular access is mainly due to conditions that lead the patients to receive certain vascular access rather than complications related to the vascular access itself. Healthier patients received an AVF, and the patients with poorer condition CVC.

Whenever we had the opportunity, we placed AVF in our patients, but when conditions were not favorable, especially in patients with poor life expectancy we chose to insert tunneled or non-tunneled CVC as permanent vascular access for hemodialysis.

Age itself is not a factor for choosing a type of vascular access. In some situations, having AVF can be seen as a marker for patient with a generally good condition and longer survival.

## Conclusion

Arterio-venous fistula is the best option for permanent vascular access regardless of the age of the patients. Still, when the conditions are not favorable, such as thrombosis, non-maturation of AVF and especially very poor general condition with short life expectancy tunneled cuff catheters and even non-tunneled CVC can be seen as a viable option.

*Conflict of interest statement:* None declared

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