

# Analysis of clinical outcomes of arteriovenous fistula for hemodialysis access in a Mexican elderly population

## *Análisis de los resultados clínicos de fístulas arteriovenosas para acceso de hemodiálisis en población adulta mayor mexicana*

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### Abstract

**Objective.** The increased survival rates of end-stage renal disease (ESRD) patients have impacted directly in the proportion of elderly patients requiring a reliable hemodialysis (HD) access; this group clearly demands an individualized approach. We aim to analyze maturation and patency rates of arteriovenous fistulas (AVF) in elderly patients. **Methods.** This was retrospective review of a database of patients that underwent AVF creation in our institution. The maturation and patency rates were analyzed divided in groups based on age (equal and greater of 65 years, and patients under 65 years). Patency rates were compared using Kaplan–Meier analysis. **Results.** Twenty patients  $\geq 65$  years old (mean 73,  $SD \pm 5.4$ ) were analyzed. The overall maturation rate in this group was 75% compared to 84.1% ( $p = 0.33$ ) in the younger group (mean age 48 years,  $SD \pm 17$ ). The primary patency at 6 and 12 months for the  $\geq 65$  years group was 93% and 86%, respectively, compared with 85% and 81% for the younger group ( $p = 0.77$ ). **Conclusion.** Autogenous AVF remains the preferred and durable option for elderly patients. We found no difference in terms of maturation and patency rates compared to younger patients. Standardized protocols are needed to optimally select vascular accesses.

**Keywords:** Arteriovenous fistula. Elderly. End stage renal disease.

### Resumen

**Antecedentes.** El aumento de las tasas de supervivencia en los pacientes con enfermedad renal terminal ha impactado en los pacientes con acceso para hemodiálisis. **Objetivo.** Analizar las tasas de maduración y permeabilidad de las fístulas arteriovenosas en pacientes adultos mayores. **Método.** Estudio retrospectivo en el que se incluyeron pacientes a los que se realizó fístula arteriovenosa. Las tasas de maduración y permeabilidad se analizaron divididas en grupos según la edad ( $\geq 65$  y  $< 65$  años). Las tasas de permeabilidad se compararon mediante análisis de Kaplan-Meier. **Resultados.** Se analizaron 20 pacientes  $\geq 65$  años. La tasa de maduración global en este grupo fue del 75%, frente al 84.1% ( $p = 0.33$ ) en el grupo más joven. La permeabilidad primaria a los 6 y 12 meses para el grupo  $\geq 65$  años fue del 93% y el 86%, respectivamente, en comparación con el 85% y el 81% en el grupo más joven ( $p = 0.77$ ). **Conclusiones.** La fístula arteriovenosa autógena sigue siendo la opción preferida y duradera para los pacientes de edad avanzada. No encontramos diferencias en cuanto a las tasas de maduración y permeabilidad en comparación con los pacientes más jóvenes.

**Palabras clave:** Fístula arteriovenosa. Adulto mayor. Enfermedad renal en etapa terminal.

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## Introduction

The prevalence of elderly patients in hemodialysis (HD) keeps growing as end-stage renal disease (ESRD) increases as well. It is estimated that the rate of patients over 65 years in HD grows more than 10% annually, only in the United States<sup>1</sup>, and about 11% of the HD patients in Australia are over 75-years-old<sup>2</sup>. Usually, these patients have shorter life expectancy, more comorbidities, and lower quality of life; although well established by Fistula First Initiative<sup>3</sup> that the ideal vascular access (VA) in patients on HD is a native arteriovenous fistula (AVF), it seems to be not well-studied and a standardized practice in this age range.

There are reports of lower patency rates, lower maturation rates, and lower rates of AVF use in elderly patients<sup>4-7</sup>, probably because there are no standardized guidelines to determine which of these patients benefit from an AVF as a VA for HD. The primary and secondary patency rates reported at 1 year in the elderly range from 40% to 75% and 56% to 82%, respectively, some studies have published similar outcomes for both groups, against the concept of worst outcome for the elderly group<sup>8</sup>.

Due to the lack of clinical guidelines and recommendations in this specific population, the rates of AVF, arteriovenous grafts (AVG), and HD catheters are different from those reported in other populations and vary between countries and regions of the world; some groups reported that up to 75% of HD patients used catheters for this purpose<sup>9</sup>. The 2018 ESVS Clinical Guidelines did not make a clear reference of decision making based on the age of the patients; they suggest permanent catheter in short life expectancy and mentioned a that a gap in evidence is "age should trigger access modality?"<sup>10</sup>. The 2019 KDOQI Clinical Practice Guideline for VA: 2019 Update does not make any specific recommendation in this group but recommends taking life expectancy and age of the patient to decide the best VA<sup>11</sup>.

The objective in this study was to evaluate the maturation and patency rates as well as complications in patients above 65 years that underwent a AVF creation and to compare them with our institutional experience with patients under this age. We hypothesize that with proper pre-operative planning, clinical outcomes should not be different among the age groups.

## Materials and methods

We performed a retrospective analysis of the AVF created between 2011 and 2017 in patients with age > 65 years in our institution and compared them with patients under 65 years. We recorded demographic data, etiology of ESRD, and the reported patencies and complications associated to the AVF or the AVF creation. We used measures of central tendency for continuous variables. We used Chi-square test, with 95% of confidence interval and considering p value (< 0.05) as statistically significant for comparing frequencies. We used Kaplan–Meier analysis for patency rates during a mean follow-up period of 20 months and compared the patency rates between patients  $\geq$  65 years and younger. We used the maturation definition proposed by the 2018 ESVS guidelines, the rule of 6's: vein diameter of 6 mm, 6 mm of from skin to vein depth, and 600 mL/min flow<sup>10</sup>.

This study was approved by the Institutional Review Board of Clinical Research and follows their ethical standards in clinical research REF. 3548. Wavier of consent was obtained before enrolling subjects.

## Results

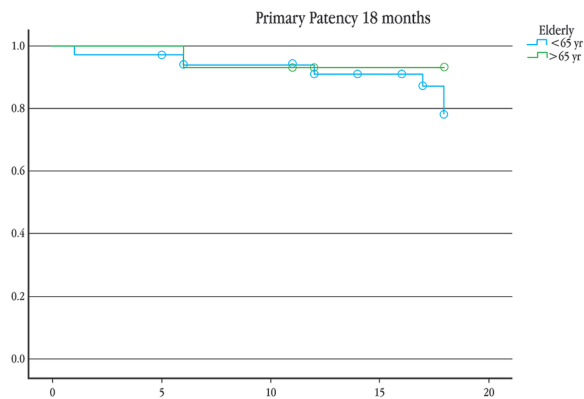
A total of 20 patients  $\geq$  65 years old underwent AVF creation for HD in our institution between 2011-2017; the mean age was 73 (SD  $\pm$  5.4) and 65% were man; comorbidities are exposed in table 1, only diabetes mellitus had statistical significance 60% for the elderly group compared with 33% ( $p = 0.05$ ). From these AVF, 18 were brachiocephalic, and 2 were radiocephalic. No major complications reported. The primary patency (Fig. 1) at 6 and 12 months for the  $\geq$  65 years group was 93% and 86%, respectively, compared with 85% and 81% for the younger group ( $p = 0.77$ ). The overall maturation rate was 75% compared with 84% ( $p = 0.33$ ) of our patients < 65-years-old (Fig. 2). From the 15 patients with functional AVF, only one died < 2 years after the AVF creation, secondary to pneumonia, 1 year after AVF creation. The longest reported functionality of an AVF is 7 years.

## Discussion

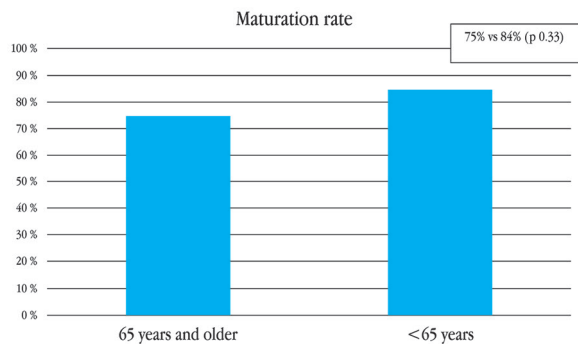
The reported maturation in our institution was 75%. We did not find a risk of non-maturation associated with the age of the patient, compared to a doubling of the risk in patients older than 65 years reported in the literature<sup>6</sup>. This association has been attributed to

**Table 1. Comparison of patient's comorbidities and medication**

Variables	≥ 65 years (n = 20)	< 65 years (n = 82)	p - value
Gender	F: 35% (7) M: 65% (13)	F: 51.2% (42) M: 48.8% (40)	0.19
Type 2 diabetes mellitus	60% (12)	32.9% (27)	0.02*
Hypertension	95% (19)	95% (78)	0.9
Antiplatelet	10% (2)	2.5% (2)	0.1
Anticoagulation	8.8% (7)	0%	0.5



**Figure 1. Kaplan–Meier primary patency rates.**



**Figure 2. Maturation rate ≥ 65 years 75% versus < 65 years 84% (p = 0.33).**

fewer adequate vessels in these patients; we have overcome this problem with a adequate pre-surgical vessel mapping, we have very strict protocols with the patients who are programmed to AVF creation no matter the age: it consist of pre-surgical venography (if more than one HD catheter has been used) and a bilateral mapping of the arm vessel, taking a minimum

artery diameter as 2 mm and venous diameter of 3 mm. Our 1-year primary patency rate was 86% compared with 68 – 70% reported by Swindlehurst<sup>8</sup>. These results are contrary to a meta-analysis of 13 studies that reported a higher rate of fistula failure at 1 year for the ≥ 65 years or older group with OR 1.54; p = 0.001, and OR = 1.36; p = 0.01 at 2 years<sup>12</sup>. We did not see difference between the primary patency rates at 6 and 12 months from both age groups, 93% and 86%, respectively, compared with 85% and 81% (p = 0.77), we cannot establish age as a determining factor in the prognosis of the fistula. It is important to comment on our two patients over 80 years who underwent AVF creation; as of today, both are alive, one is 85 years old and the other one 92 years, both AVF is functioning. Although we found, significant difference between proportions of patients with type 2 DM in the groups, we do not think, is a factor in favor of maturation rates in the elderly group.

Secondary to the heterogeneity of the published information, there is not a consensus or guidelines for the use and type of VA for HD in elderly patients. Lok recently published their recommendations for selecting ideal VA for the elderly people undergoing HD, they concluded that this decision is not easy and depends on multiple factors. We cannot obsess with the idea of “Fistula First”<sup>13-16</sup> in these patients, even though we report good maturation and patency rates, there are a lot of other factors we have to take in mind to make the decision. We like the concept adopted by Lok “patient first” strategy, the take in mind the patient’s desires and preferences, as well as the expectations of the VA we will offer them; patient comorbidities and life expectancy must also be taken into account, taking in mind that a AVF takes an average of 90 days to mature, as well as the risk of the chronic use of a central venous catheter for HD in these patients<sup>17</sup>. As commented in the 2018 ESVS access guidelines, this is still a gray area<sup>10</sup>.

The main flaw of our study is the low number of patients included but adds favorable data regarding outcomes in AVF creation in elderly patients; it is the largest report yet in Hispanic population; It is important to emphasize that we take all our potential AVF candidate to an exhaustive and meticulous pre-operative evaluation, more if they are 65 or older. Our patients underwent geriatric, cardiovascular, and anesthesiology evaluation before surgery, to establish life expectancy; once decided between the specialists that the AVF is the best option, we perform the vessel mapping and decide which configuration could the

best, if no native vessels available, we decline the option for AVF; although there are some studies comparing AVF, grafts, or central venous catheters for the elderly<sup>18</sup> that we are not comfortable using grafts due to the risk of complications and need of reintervention. Our institution minimum diameters are cephalic or basilic vein minimum of 3.0 mm without tourniquet compression, or 2.0 mm with an increase diameter of 0.5 mm minimum and the vein should have a non-sclerotic course through the arm; artery should be greater to 2.0 mm to be considered for AVF.

It is well known the differences in complications rates and mortality among countries, and ethnic groups, therefore, this study is important to understand the behavior of these procedures in a Mexican population. The weakness and limitations of this study include its retrospective nature, and that it is only one single center experience. Another detected flaw is that we only reported primary patency; unfortunately, we cannot offer rescue therapy for all the thrombosed patients, so the secondary patency is not reliable. We can use this as an example and start to formulate local and multinational guidelines for elderly patients in HD.

## Conclusion

We reported higher maturation and patency rates than some of the published ones, and low complication rates, we even have one patient with 7 years functioning AVF. We conclude that AVF can and must be an option for selected patients with adequate cardiovascular reserve, fit for surgery and good life expectancy (over a year), and also to know the patient's preferences and expectancies from the AV for HD.

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## Conflicts of interest

The authors declare no conflicts of interest.

## Ethical disclosures

**Protection of human and animal subjects.** The authors declare that no experiments were performed on humans or animals for this study.

**Confidentiality of data.** The authors declare that no patient data appear in this article.

**Right to privacy and informed consent.** The authors declare that no patient data appear in this article.

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