

Short Communication

Evaluation of Functional Capacity through the 6 Minutes Walking Test (6MWT) in Patients with CKD

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Introduction

The Chronic Kidney Disease (CKD) is a major public health problem, by the disease itself, or the multiple comorbidities that may influence their establishment and progression. These pathologies as cardiovascular disease or diabetes mellitus sometimes adversely affect the functionality of the patient, impacting on the quality of life of the same [1-5].

A way to mitigate the negative effects of the reduction of the functional capacity is to evaluate and monitoring this item as part of a fully treatment.

The aims of the study was to determine the muscle strength of the lower extremity of patients with Advanced Chronic Kidney Disease (ACKD) through the 6-Minute Walking Test (6MWT).

Materials and Methods

Prospective observational study, which assessed 108 CKD patients of the ACKD Unit of the Hospital Universitario de la Princesa in Madrid using the 6MWT.

We evaluated patients in the Advanced Chronic Kidney Disease Unit who did not have a physical disability that prevented them from walking.

The 6MWT test to measure resistance and therefore functional capacity. The patients have to walk for 6 minutes on a flat surface and hardwood, with quickstep along a Known distance (usually a corridor of between 30 - 35 meters). Once the test is completed, the number of laps is multiplied by the meters of each lap and so we can know the distance traveled by the patient [6].

Through the formula of Troosters [7], estimated the theoretical distance, which the patient must walk:

$$\text{Men: } 218 + (5.14 \times \text{cm size}) - (5.32 \times \text{age}) - (1.8 \text{ kg } \times \text{weight}) + 51.3$$

$$\text{Women: } 218 + (5.14 \times \text{cm size}) - (5.32 \times \text{age}) - (1.8 \text{ kg } \times \text{weight}) + 0.0$$

Through dependence scale Barthel index, determined the degree of independence, this scale consists of a series of graduated items, and the sum of them going to categorize the patient in different levels of dependence, since 0 value being absolute dependence to 100 value

independence [8]. 1. Autonomous 100, 2. Light dependence > 60, 3. Moderate dependence 55 - 40, 4. Severe dependence 35-20, 5. Depend total: < 20.

Statistical Analysis

The IBM SPSS Statistics software was used for statistical analysis for Windows, Version 23.0.

The quantitative variables were expressed with the mean±standard deviation, as well as range (minimum - maximum) and qualitative in percentage. The normality of the data was determined by the proof of Kolmogorov-Smirnov, the resulting data with normal distribution, was the test statistical t-student for independent samples.

Results

Of 150 patient's ACKD unit, 108 were evaluated, of which a 73.15% were man (79) and a 26.85% woman (29). The remaining patients could not be assessed with this test for physical disability. The mean overall age of the patients was 67, 36±12.95 years (r: 33-94), being similar between sex (67, 35±12, 97 years (r: 33-94) for male and 67, 39±13, 11 years (r: 36-85) for female (p 0.99).

The global glomerular filtration rate estimated by CKD-EPI 1 was 18, 32±7, 07mL/min/1.73m₂, male: 18, 23±6, 83mL/min/1.73m₂, men and female 18, 54±7, 79mL/mim/1.73m₂. We found significant direct correlation between GFR and stepped meters (p 0.005).

According to the equation of Troosters the expected values were 592±84, 70m for men and 528, 47±101, 37m for women, founding significant difference between them (p 0,001).

In this study the walking distance determined by the test 6MWT global was 586.39±155. 00m (r 120-1040), in men was 588, 54±162, 89 m (r: 120-1040) and in women 580.51±133, 60m (r: 375-800) not being different the walking distance between man and woman (p 0.81).

The resulting global percentage by the equation of Troosters, was not significant between men and women (0.323), being higher the difference between the theoretical percentage vs real % in women vs men Table 1.

Stratified sample by gender and age range Table 2, observed how more than 50% walk more than expected, determined by the formula of Troosters, being the majority including between 60 and 80 years' age groups.

Table 3 shows the Barthel scale by age ranges. Is observed as the patients generally have a high score on the scale. Also, found a significant correlation between the stepped meters (p 0.000) and Barthel scale, although without significant differences between men and women.

Table 1: Theoretical percentage by gender.

	Theoretical percentage			Total patients
	< 75%	75-100%	> 100%	
Man	21,52%(17)	21,52%(17)	56,96%(45)	79
Woman	10,34%(3)	27,59%(8)	62,07%(18)	29
Total	18,52%(20)	23,15%(25)	58,33%(63)	108

Table 2: Theoretical percentage by gender and age.

Age	Gender	Theoretical percentage			Total
		< 75%	75-100%	> 100%	
< 40 years	Man	0	1	1	4
	Woman	1	1	0	
40-50	Man	5	2	1	10
	Woman	1	0	1	
50-60	Man	3	1	9	17
	Woman	0	1	3	
60-70	Man	1	3	12	21
	Woman	0	2	3	
70-80	Man	6	8	13	39
	Woman	1	3	8	
> 80	Man	2	2	9	17
	Woman	0	1	3	
Total		20	25	63	106

Table 3: Barthel scale stratified by age and sex.

Age	Gender	Barthel scale						Total
		70,00	75	80,00	90,00	95,00	100,00	
< 40 years	Man						2	2
	Woman						2	2
40-50	Man						7	7
	Woman						1	1
50-60	Man						13	13
	Woman						4	4
60-70	Man						16	16
	Woman						5	5
70-80	Man			0	2		24	26
	Woman			1	1		9	11
> 80	Man	1	0	1	4	1	6	13
	Woman	0	1	1	0	0	2	4
Total	Man	1	0	1	6	1	68	77
	Woman	0	1	2	1	0	23	27

Discussion and Conclusions

The 6MWT test is widely used in Nephrology, using it in different studies covering the different stages of the disease, and as a tool to evaluate functionality in different treatments (hemodialysis, peritoneal dialysis and kidney transplantation) [9-12].

This test can be used to assess the quality of life [9], as a predictor

of mortality [13,14], to evaluate the degree of rehabilitation after a program of physical activity [10], or to assess the effort and the appearance of dyspnea [11].

This test has been used to evaluate mortality in patients with CKD in HD demonstrating that a decrease in capacity, measured by the 6MWT test corresponds to an increase in mortality and hospital stay [15].

It is important to evaluate the functional capacity from the early stages of kidney disease, since as it progresses, function simultaneously worsens, as we found in our study. If the early diagnose of functional decrease is made, we can prescribed exercise guidelines to mitigate the negative effects [16], being also a relatively easy-to-use test and that is related to the percentage of muscle mass.

In this study we have found that in spite of advanced age in a high percentage of patients, we obtained a working stepped meters higher than theoretical 100% mainly in women. This results could be justified for a high value in Barthel scale in patient's age rate between 60-90 years.

Due to clinical relevance, the 6MWT test is a very useful tool to assess the functional capacity of patients with CKD. The degree of renal impairment and dependence assessment degree is going to influence the functionality for this reason must be taken into account in all stages to mitigate the negative effects described. It is important to establish age ranges that help us to explain the functional impairment with respect to the reference population. Despite the good results obtained in the study, it should be noted that there is a percentage patients with advanced CKD who do not have a good resistance in lower extremities, requiring other test to assess functionality.

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