

BODY COMPOSITION ANALYSIS BY SPECTROSCOPIC BIOIMPEDANCE IN KIDNEY ALLOGRAFT RECEPTORS. FACTORS RELATED TO OVERHYDRATION AND FAT EXCESS AND THEIR GLOBAL CLINICAL IMPACT

N.Panizo, J.Reque, M.Goicoechea, D.Arroyo, A.Santos, A.Vega, J.M López-Gómez. HGUGM.

INTRODUCTION

Renal transplant patients have a higher overall cardiovascular risk compared to general population. Excessive fat mass associated with disorders of glucose and lipid metabolism, as well as overhydration, leading to cardiac overload, are more prevalent in renal transplant patients than in general population and may influence their increased risk of cardiovascular morbidity and mortality. Because of this, it is crucial the early detection of these alterations to act on them and reduce cardiovascular events. Among the different methods to study body composition, BIS is one of the most interesting because of its simplicity, low cost, immediacy, reproducibility and safety for the patient. The exact knowledge of the influence of body composition by accurate instruments, can determine treatment decisions such as minimization or early withdrawal of steroid therapy, optimized diuretic therapy and changes in hygiene and dietary advice, to achieve lower cardiovascular morbidity and mortality in renal transplant patients without compromising the graft function.

MAIN OBJECTIVE

This study aims to define the body composition (fat mass, lean mass, total body water and overhydration), studied by BIS in the largest cohort of renal transplant patients studied by this method to date.

SECONDARY OBJECTIVES

We analyze on one hand the factors associated with excess body fat and hydration, and on the other hand the influence of the latter on other cardiovascular risk factors, including metabolic and cardiac abnormalities, as well as the occurrence of cardiovascular events, mortality and allograft failure along the follow-up period.

MATERIAL AND METHODS

This is a prospective, observational, longitudinal study that included 262 renal transplant followed at the Kidney Transplant Unit of Hospital Gregorio Marañón.

Employing BIS, the amount of fat mass, lean mass, total body water (TBW), extracellular water (ECW), intracellular water (ICW) and absolute overhydration (OH) (defined as deviation from the euhydration defined by population studies), as well as relative overhydration (defined as OH/ECW ratio) were recorded.

Analytical data corresponding to the time of BIS, and echocardiographic data in patients in which they were available were recorded.

Received immunosuppressive medication was also recorded.

Patients were followed for a mean of $26,8 \pm 6,3$ months, and cardiovascular events graft loss and mortality were collected.

BASAL CHARACTERISTICS

BIOIMPEDANCE	MEDIA±SD	Media ±SD /Median (IQR)	ANTHROPOMETRY	MEDIA±SD	
TBW (l)	36±8,2	Creatinine (mg/dl)	1,3 (1-1,8)	Waist (cm)	93±13,8
ECW(l)	16,6±3,4	GFR CKD-EPI (ml/min)	52,4±28,5	Conicity Index	1,3±0,1
ICW (l)	19,5±4,9	PCR (mg/dl)	0,2 (0,1-0,6)	Weight (kg)	70,1±14,8
Absolute overhydration (OH) (l)	0,81±1,6	Ferritin (mg/dl)	239 (66-232)	Height (cm)	164±10,3
Relative overhydration % (OH/AEC)	4,4±8,5	Total cholesterol (mg/dl)	185,4±38,3	BMI (kg/m ²)	26±4,9
Lean Tissue Index (kg/m ²)	14,7±3,9	HDL (mg/dl)	59,7±19,2		
Fat Tissue Index (kg/m ²)	10,3±5,6	LDL (mg/dl)	102,3±31,4		
		TG (mg/dl)	127,1±69,6		

EVENTS RISK

RISK OF CARDIOVASCULAR EVENTS

Cox regresión
Adjusted for age, sex, GFR and previous CV events

	p	RR	CI
GFR (ml/min)	0,022	0,98	0,956-0,997
Previous CVE	0,000	5,97	2,408-14,828
OH (l)	0,015	1,34	1,059-1,690
OH/AEC (%)	0,030	1,06	1,006-1,114

RISK OF GRAFT LOSS

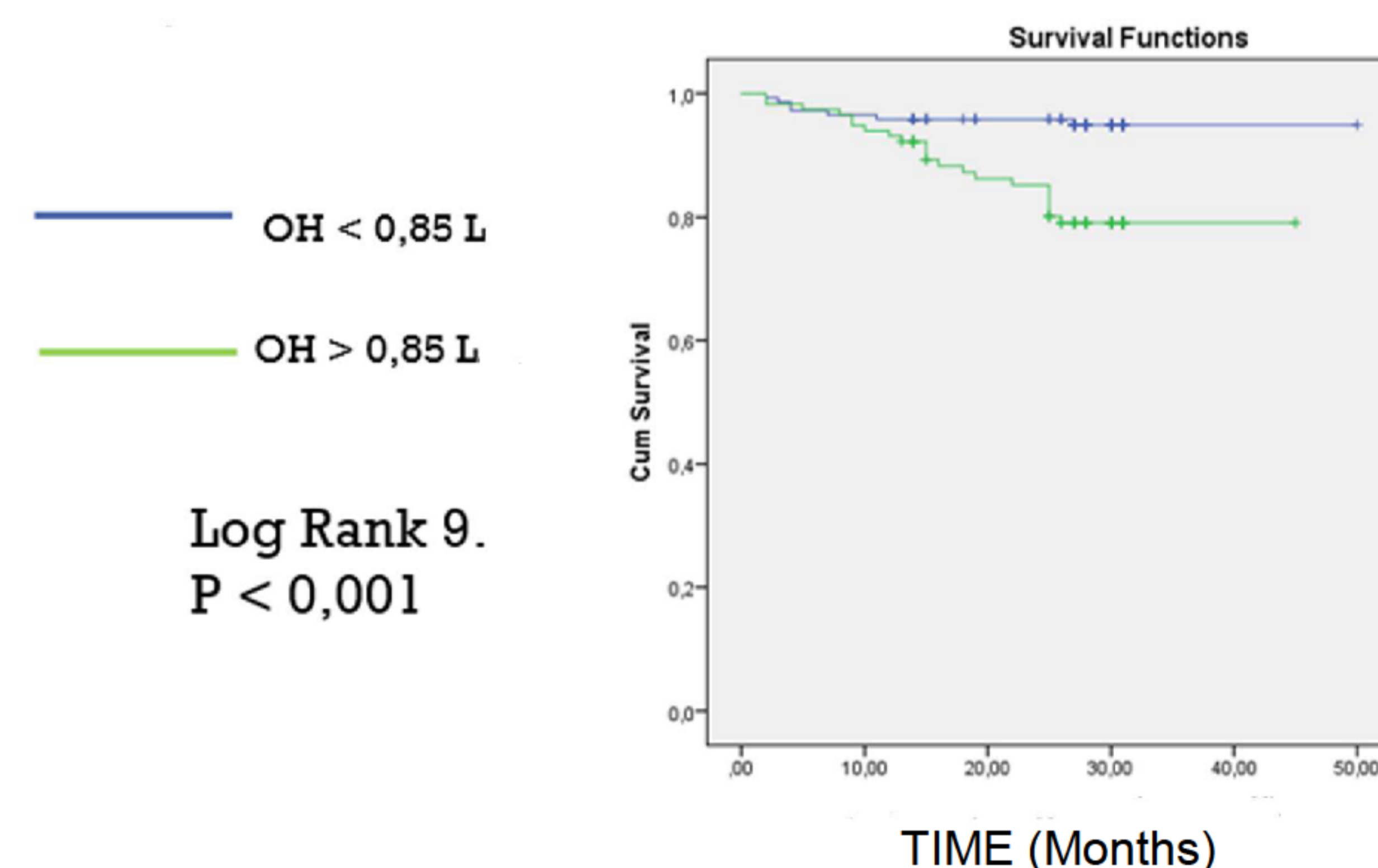
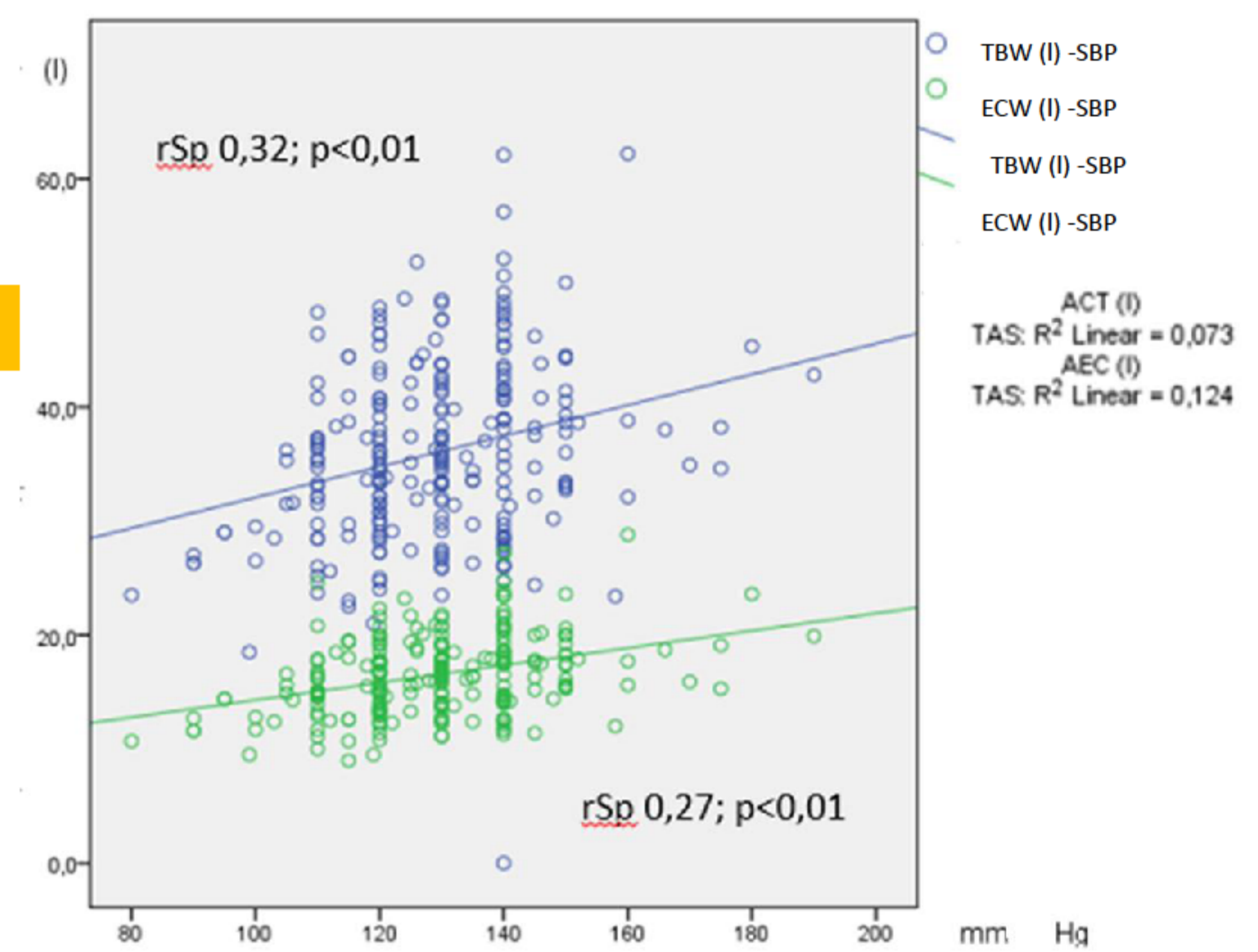
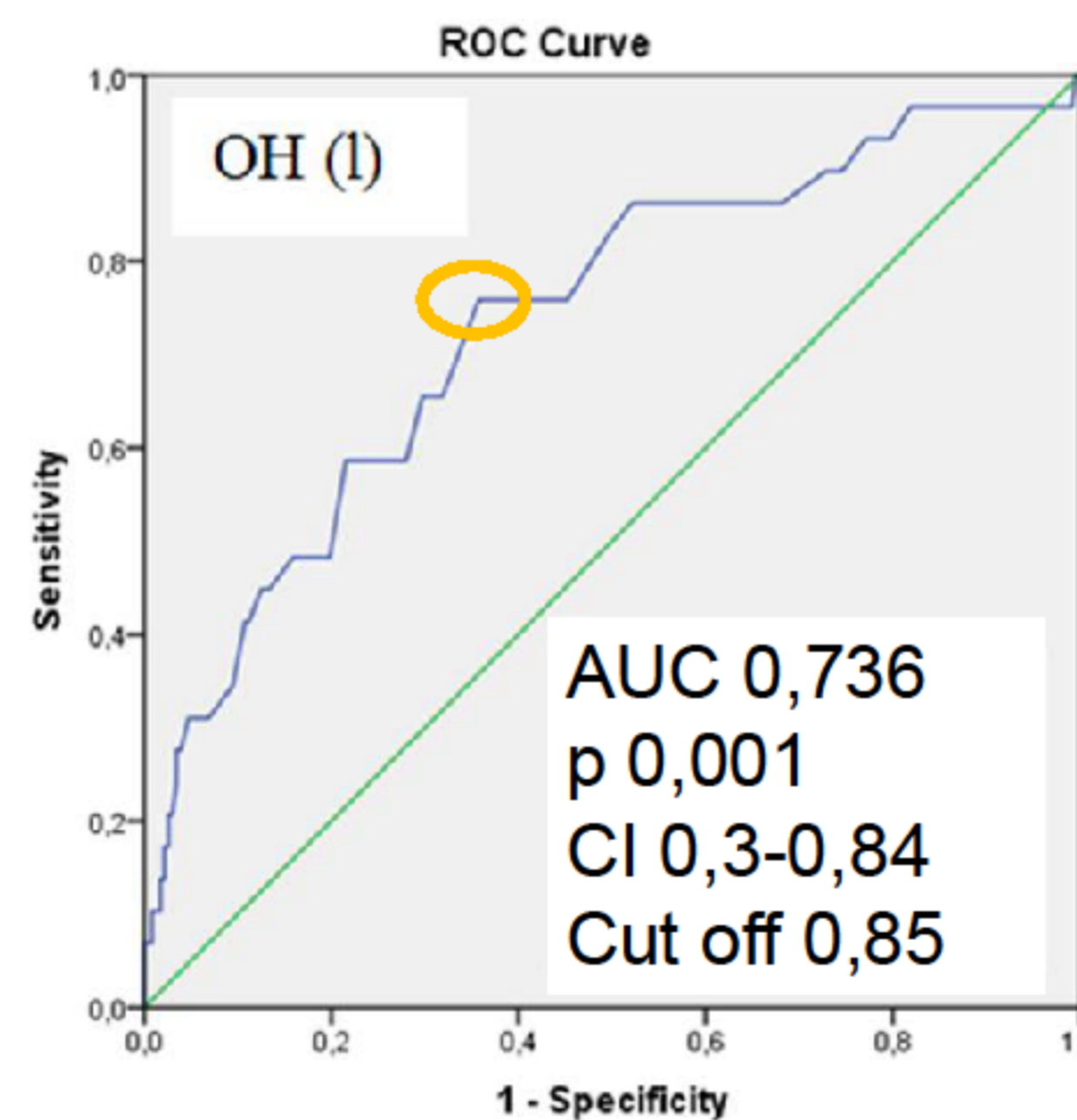
Cox regresión
Adjusted for age, GFR, systolic arterial pressure and time after transplantation.

	p	RR	IC
Total time from transplantaion	0,025	1,004	1,000-1,007
GFR (ml/min)	0,014	0,93	0,893-0,987
SBP (mm de Hg)	0,190	1,031	0,985-1,078
OH (l)	0,105	1,402	0,932-2,107

MORTALITY RISK

Cox regresión
Adjusted for age and CVE

	p	RR	IC
Age (years)	0,042	1,083	1,003-1,170
Cardiovascular event during follow-up	0,019	5,53	1,329-23,031
Fat Tissue Index (kg/m ²)	0,016	0,825	0,704-0,965



RESULTS

Our study included 262 renal transplant patients, of which 57.3% were male and 42.7% female, with a mean age of 57 ± 15.2 years. The patients studied had a significantly higher fat mass than general population, keeping this good correlation with BMI and conicity index (CI).

Despite the confirmed correlation between fat mass and lipid and glucose profile changes, no associations between the amount of fat mass and cardiovascular events or graft loss were found. However, we found less fat mass in patients who died during the follow-up.

Contrary to expectations, no correlation was observed between the cumulative dose of steroids and the amount of fat mass, which is lower in those who had received treatment with azathioprine or steroids.

BIS confirmed that patients with previous cardiovascular events or with graft dysfunction have a higher hydration status than those with normal function, without encountering association between immunosuppressive medication and hydration status.

In our patients, body water excess is associated with higher systolic and diastolic blood pressure. A weak but statistically significant correlation was found between body water and left ventricular mass, but not with other echocardiographic data.

Finally we observed that overhydration measured by different parameters offered by BIS, is an independent risk factor for cardiovascular events and renal graft loss during follow-up.

CONCLUSIONS

BIS is a useful method for the study of body composition in kidney transplant patients, in particular as regards to hydration parameters. The amount of fat mass detected by BIS is not influenced by the usual immunosuppressive therapy and provides no advantages over the classic antropométric parameters for the detection of cardiovascular risk. In fact, it appears as a protective factor in terms of mortality. However, overhydration is a risk factor for cardiovascular events and graft loss. Consequently, the early detection of subclinical overhydration can prevent cardiovascular risk optimizing other risk factors control as well as diuretic therapy under strict and objective control of hydration status to avoid graft function decreasing due to excessive dehydration.

Harada, H., et al., Percentages of water, muscle, and bone decrease and lipid increases in early period after successful kidney transplantation: a body composition analysis. Transplant Proc, 2012. 44(3): p. 672-5.

Wissing, K.M. and L. Pipeleers, Obesity, metabolic syndrome and diabetes mellitus after renal transplantation: prevention and treatment. Transplant Rev, 2014. 28(2): p. 37-46.

Chan, W., et al., Hypervolemia and blood pressure in prevalent kidney transplant recipients. Transplantation, 2014. 98(3): p. 320-7

