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Correlation between handgrip strength and muscle mass with biochemical and body composition parameters.

Ana Valente[1], Ana Laura Flores[2], Cristina Garagarza[1]
[1] Nephrocare, Lisbon, Portugal.
[2] Faculty of Medicine, Universidad de Colima, Colima, México.
Cristina Garagarza: **cgaragarza@hotmail.com**

Introduction and objective

Hemodialysis (HD) patients are vulnerable to multiple metabolic and nutritional derangements leading to changes in body composition. Several methods to assess muscle reserves have been used, one of them is the handgrip strength (HGS), a simple and reliable method that evaluates muscle strength and it has been used as a nutritional marker. The aim of this study was to evaluate the correlation of HGS with biochemical parameters and body composition in HD patients.

Methods

- Single center, cross-sectional study, where 155 patients in HD were included.
- Body composition was assessed through bioimpedance spectroscopy.
- HGS was measured with a hydraulic hand dynamometer in the opposite hand to the vascular access.
- Protein intake was assessed through normalized protein catabolic rate (nPCR). Albumin and total protein were also evaluated.
- Data were analyzed by sex. A p value <0.05 was considered statistically significant. IBM SPSS version 20 (IBM, Chicago, IL) was used to perform statistical analysis.

Results

Table 1. Patient´s characteristics by gender (n= 155)

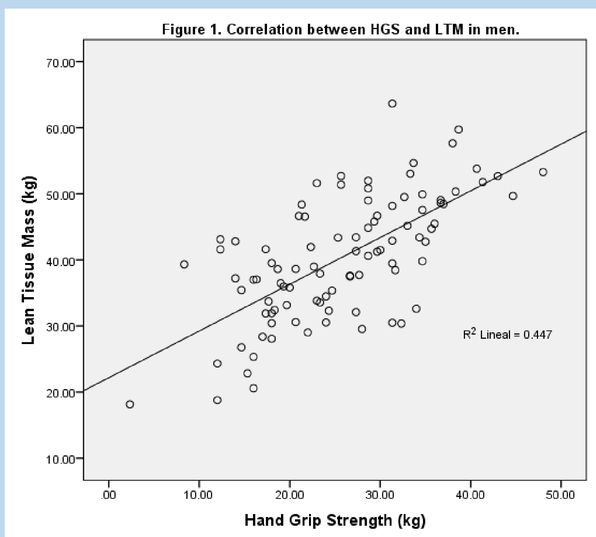
Variable	Men 60.6% (n=94)	Women 39.4% (n=61)	p
Age (years)	64.7±14.96	64.02±14.4	0.778
HD vintage (months)	67±54.24	89.36±79.32	0.057
Serum albumin (g/dl)	4.03±0.29	3.97±0.32	0.285
Total proteins (g/dl)	**6.91±0.49**	**6.74±0.44**	**0.034***
nPCR (g/kg/day)	1.11±0.25	1.1±0.18	0.63
Dry weight (kg)	70.8±12.15	66.77±14.07	0.09
BMI (kg/m^2)	**25.12±3.84**	**27.76±5.44**	**0.001***
OH/ECW pre dialysis (%)	12.1±6.58	11.18±7.61	0.388
LTM (kg)	**40.37±9.34**	**28.54±7.43**	**< 0.001***
LTI (kg/m^2)	**13.79±3.03**	**11.43±2.75**	**< 0.001***
Fat Mass (kg)	**22.13±9.82**	**28.05±11.63**	**0.001***
FTI (kg/m^2)	**10.27±4.42**	**15.4±6.53**	**< 0.001***
Body cell mass (kg)	**22.28±6.57**	**15.05±5.1**	**< 0.001***
HGS [a] (kg)	**25.74±8.83**	**14.24±7.09**	**< 0.001***

Values presented as Mean ± SD ; *** Significant p *values* (p <0.05)**
nPCR- normalized protein catabolic rate, HD - hemodialysis, BMI - body mass index, TBW - total body water, OH/ECW - Overhydration/ Extracellular water, LTM - lean tissue mass, LTI - lean tissue index, FTI - fat tissue index, HGS - handgrip strength.

Table 2. Pearson's correlation of hand grip strength by gender

Variable	Handgrip strength (kg)			
	Men n= 94		Women n= 61	
	r	p	r	p
Age (years)	**-0.526**	**< 0.001***	**-0.396**	**0.002***
HD vintage (months)	-0.027	0.793	-0.214	0.097
BMI (kg/m^2)	**0.232**	**0.024***	0.113	0.384
Serum albumin (g/dl)	**0.295**	**0.004***	0.225	0.081
Total protein (g//dl)	0.139	0.182	0.237	0.065
nPCR (g/kg/day)	0.028	0.797	0.115	0.390
Magnesium (mg/dl)	**0.275**	**0.008***	-0.054	0.681
LTM (kg)	**0.668**	**< 0.001***	**0.475**	**< 0.001***
LTI (kg/m^2)	**0.592**	**< 0.001***	**0.331**	**0.009***
Body cell mass (kg)	**0.652**	**< 0.001***	**0.432**	**0.001***
OH/ECW pre dialysis (%)	**-0.427**	**< 0.001***	**-0.336**	**0.008***

*** Significant p *values* (p <0.05)**
nPCR- normalized protein catabolic rate, HD - hemodialysis, BMI - body mass index, OH/ECW - Overhydration/ Extracellular water, LTM - lean tissue mass, LTI - lean tissue index



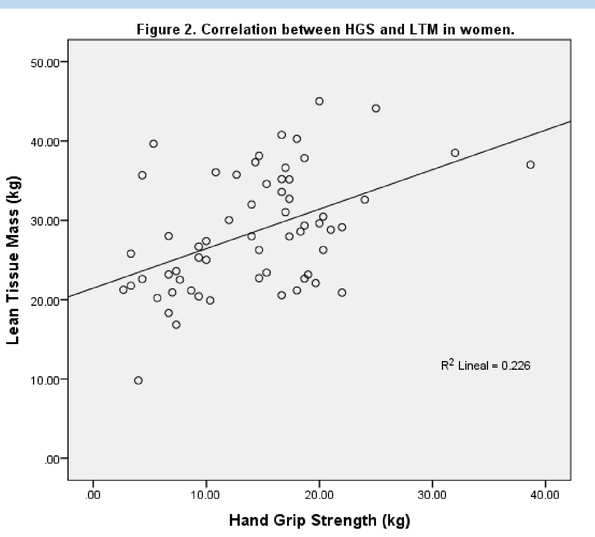


Figure 1. Correlation between HGS and LTM in men.

Figure 2. Correlation between HGS and LTM in women.

A positive correlation of HGS with lean tissue mass was found.

Conclusion

Muscle strength is positively correlated with muscle mass, therefore the muscle strength can be a good marker to determinate changes in muscle mass. Gender influences strength as it is usually higher in men, even in patients in HD. The HGS tends to decrease with aging. In summary, muscle strength is not only about muscle size, there are other entities that may be associated, as age, sex and biochemical parameters.

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Ana Valente
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