

# Handgrip Strength Predicts Survival of Chronic Hemodialysis Patients



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## OBJECTIVES

Poor muscle quality had been associated with mortality in hemodialysis (HD) patients. Handgrip strength (HGS) is a reproducible and easily performed test that correlates with lean body mass. It may predict malnutrition and renal outcomes in CKD patients, and circulatory congestion in peritoneal dialysis patients. However, how well can HGS predict mortality in HD patients has not been established. Our aim is to investigate the role of HGS in HD patients' mortality and outcome.

## METHODS

188 stable HD patients (78 males) were enrolled in the study from January to December 2009. For each patient, baseline HGS was measured by grip dynamometer, and mid-arm muscle circumference (MAMC) and triceps skinfold thickness (TST) were measured with standard plastic tape and Lange Skinfold Caliper. Each measurement was repeated 3 times for every patient, and the average value was used for analysis. Midarm muscle circumference (MAMC) was calculated from:  $MAC - (\pi \times TSFT)$ . Midarm muscle circumference area (MMCA) was calculated from:  $(MAMC)^2 / (4 \times \pi)$ . Baseline biochemical data as well as demographic features were reviewed and collected.

## RESULTS

1. During the median follow-up period of 47 months, 34 (17 males) out of 188 patients died.
2. Univariate analysis (Table 1) showed that survivors had significantly higher HGS, serum albumin, Kt/v, nPCR, and lower waist circumference, IL-6, hsCRP.
3. Survivors also had less diabetes (23% [35] vs. 47% [16],  $p=0.006$ ) and cardiovascular disease (41% [63] vs. 62% [21],  $p=0.036$ ).
4. Cox regression hazards analysis identified higher HGS (HR 0.891, 95% CI 0.838-0.948;  $p<0.001$ ) and Kt/v (HR 0.086, 95% CI 0.018-0.421;  $p=0.002$ ) as the only two significant independent predictors for better survival in hemodialysis patients.
5. HGS was significantly lower in female ( $19.6 \pm 6.3$  vs.  $28.4 \pm 10.4$  kg [male],  $p<0.001$ ) and diabetic ( $19.3 \pm 8.0$  vs.  $24.1 \pm 9.2$  kg [non-diabetic],  $p=0.007$ ) patients.
6. For female patients, a HGS less than 17kg had a positive predictive value (PPV) of 39% and negative predictive value (NPV) of 96% for predicting mortality.
7. For male patients, a HGS less than 26kg had a PPV 29% and NPV 84% for predicting mortality.

TABLE 1.

	Died (34)		Alive (154)		P-value
	Standard Mean	Standard Deviation	Standard Mean	Standard Deviation	
Age (years)	62	9	59	11	0.148
HD vintage (months)	72	61	75	53	0.79
Interleukin-6 (pg/ml)	5.6	6.1	3.4	3.8	0.048
Tumor necrosis factor-alpha (pg/ml)	7.5	5.8	8.3	6.4	0.472
Hemoglobin (g/dL)	10.4	0.9	10.6	1.3	0.301
Serum albumin (g/dL)	3.9	0.2	3.9	0.3	0.141
Serum creatinine (mg/dL)	10.3	2.2	11.0	2.0	0.087
Serum calcium (mg/dL)	9.3	1.0	9.3	0.8	0.702
Serum phosphate (mg/dL)	5.1	1.5	4.8	1.4	0.267
Body mass index (kg/m <sup>2</sup> )	23.2	3.6	22.8	4.0	0.567
Kt/v (dialysis adequacy)	1.3	0.2	1.4	0.2	0.022
hsCRP (mg/L)	9.5	14.0	5.0	7.1	0.073
Hand Grip Strength	16.4	8.4	24.2	8.8	<0.001
Waist circumference (cm)	89.3	10.0	84.1	12.8	0.028
Mid-arm muscle area (cm <sup>2</sup> )	36.1	10.2	36.8	11.8	0.735

## CONCLUSIONS

1. Handgrip strength provides a good marker for survival in HD patients, independent of age, DM, cardiovascular disease, and serum albumin.
2. The prognostic value of HGS should also take into account gender differences and the presence of diabetes.
3. The prognostic role of HGS should be confirmed in larger cohorts and different ethnic populations.
4. Further investigations can evaluate the utility of HGS as a marker for monitoring therapies that may alter mortality outcomes in HD patients

## References

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