Mid-Arm Muscle Circumference is a Better Survival-Predictor than Triceps Skinfold in Hemodialysis Patients

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INTRODUCTION

- Maintenance hemodialysis (MHD) patients with larger body mass index (BMI) have greater survival.
- It is not clear whether the survival advantage of larger body size is related to fat mass or lean body mass (LBM) including muscle mass.
- We hypothesized that mid-arm muscle circumference (MAMC) as a surrogate of LBM and total muscle mass has stronger association with survival than triceps skin fold (TSF), a surrogate of fat mass in MHD patients.

METHODOLOGY

- Associations and survival predictability of quartiles of MAMC and TSF were examined in a 5-year (2001-06) cohort of 792 maintenance hemodialysis (MHD) patients including 420 men and 372 women.
- We employed Cox regression based survival models to examine the association of MAMC and TSF with 5-year survival in the MHD patients cohort, adjusted for case-mix and other pertinent variables including surrogate of malnutrition-inflammation complex syndrome (MICS).

RESULTS

- Higher MAMC was associated with greater self-reported health related quality of life, as assessed by SF-36 questionnaire.
- Higher MAMC lowered death hazard ratios after incremental adjustment for case-mix, MICS and additional inflammatory cytokines.

RESULTS

- In fully adjusted models, death hazard ratios and 95% confidence interval (95% CI) for first to fourth MAMC quartiles, respectively, were:
  - 1.00 (reference)
  - 0.86 (0.58-1.29)
  - 0.69 (0.45-1.08)
  - 0.63 (0.38-1.06)
  - With a *p*-for-trend = 0.04
- Higher TSF was also associated with decreased death hazard ratio but the correlations mitigated after multivariate adjustments (Table 1). Using median values of TSF and MAMC to dichotomize, combined high MAMC with either high or low TSF (compared to both low) exhibited the greatest survival with death hazard ratio (95%CI) of 0.52 (0.36-0.77) and 0.59 (0.39-0.88), respectively (Table 1).

Table 1. Death Hazard Ratios by Mid-Arm Muscle Circumference and Triceps Skinfold Quartiles

Variables	**Mid-arm muscle circumference (MAMC) quartiles**				
	Quartile 1 (n=199)	Quartile 2 (n=198)	Quartile 3 (n=199)	Quartile 4 (n=196)	P for trend
Case-mix	1.00	0.70 (0.49-1.02) [p=0.06]	0.59 (0.40-0.87) [p=0.00]	0.55 (0.37-0.82) [p=0.00]	<0.01
Case-mix & MICS+	1.00	0.86 (0.58-1.29) [p=0.48]	0.69 (0.45-1.08) [p=0.10]	0.63 (0.38-1.06) [p=0.08]	<0.05
	Triceps skinfold (TSF) quartiles				
	Quartile 1 (n=211)	Quartile 2 (n=188)	Quartile 3 (n=195)	Quartile 4 (n=198)	P for trend
Case-mix	1.00	0.91 (0.62-1.35) [p=0.66]	0.64 (0.42-0.97) [p=0.03]	0.69 (0.45-1.07) [p=0.10]	0.03
Case-mix & MICS+	1.00	0.94 (0.60-1.47) [p=0.79]	0.66 (0.39-1.09) [p=0.10]	0.73 (0.41-1.30) [p=0.29]	0.15

CONCLUSIONS

- A higher MAMC is an independent predictor of survival in MHD patients independent of TSF as surrogate of body fat. Examining effects of sarcopenia-correcting interventions are indicated in MHD patients.
- Clinical trials to examine the benefit of nutritional or pharmacologic interventions or resistance exercise to improve MAMC in sarcopenic MHD patients are indicated.

KEY LEARNINGS

- ✓ In MHD patients higher MAMC, a surrogate of total muscle mass and larger lean body mass, is linearly associated with greater survival.
- ✓ By correcting protein-energy wasting and sarcopenia in MHD patients with nutritional and pharmacologic interventions ,MAMC and muscle mass can also be increased. It is possible that this will improve survival but this hypothesis need to be proven in randomized controlled trials.

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