

Muscle Status Response to Oral Nutritional Supplementation in Hemodialysis Patients with Protein Energy Wasting: A Multi-Center Randomized, Open Label-Controlled Trial

ABSTRACT

Background: Muscle wasting, observed in patients with end-stage kidney disease and protein energy wasting (PEW), is associated with increased mortality for those on hemodialysis (HD). Oral nutritional supplementation (ONS) and nutrition counseling (NC) are treatment options for PEW but research targeting muscle status, as an outcome metric, is limited. Aim: We compared the effects of combined treatment (ONS + NC) vs. NC alone on muscle status and nutritional parameters in HD patients with PEW. Methods: This multi-center randomized, open label-controlled trial, registered under ClinicalTrials.gov (Identifier no. NCT04789031), recruited 56 HD patients identified with PEW using the International Society of Renal Nutrition and Metabolism criteria. Patients were randomly allocated to intervention (ONS + NC, n = 29) and control (NC, n = 27) groups. The ONS + NC received commercial renal-specific ONS providing 475 kcal and 21.7 g of protein daily for 6 months. Both groups also received standard NC during the study period. Differences in quadriceps muscle status assessed using ultrasound (US) imaging, arm muscle area and circumference, bio-impedance spectroscopy (BIS), and handgrip strength (HGS) methods were analyzed using the generalized linear model for repeated measures. Results: Muscle indices as per US metrics indicated significance ($p < 0.001$) for group \times time interaction only in the ONS + NC group, with increases by 8.3 and 7.7% for quadriceps muscle thickness and 4.5% for cross-sectional area (all $p < 0.05$). This effect was not observed for arm muscle area and circumference, BIS metrics and HGS in both the groups. ONS + NC compared to NC demonstrated increased dry weight ($p = 0.039$), mid-thigh girth ($p = 0.004$), serum prealbumin ($p = 0.005$), normalized protein catabolic rate ($p = 0.025$), and dietary intakes ($p < 0.001$), along with lower malnutrition-inflammation score (MIS) ($p = 0.041$). At the end of the study, lesser patients in the ONS + NC group were diagnosed with PEW (24.1%, $p = 0.008$) as they had achieved dietary adequacy with ONS provision. Conclusion: Combination of ONS with NC was effective in treating PEW and contributed to a gain in the muscle status as assessed by the US, suggesting that the treatment for PEW requires nutritional optimization via ONS.