

## Comparison of Ultrastructural Alterations in Peripheral Artery Disease Skeletal Muscle

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### ABSTRACT

Peripheral artery disease (PAD) is characterized by obstructed hemodynamics and claudication reducing quality of life and muscle function. A myopathy has been shown to develop in PAD patients and characterization of changes in skeletal muscle needs further elucidation. **PURPOSE:** To assess myofibrillar ultrastructural changes between control and stage IV PAD patients. **METHODS:** Twenty-six participants (13 control:13 stage IV) were recruited to take part in this cross-sectional study. The mean ( $\pm$ SD) age, mass, height, and BMI were 53 ( $\pm$ 11) years, 81 ( $\pm$ 22) kg, 165 ( $\pm$ 15) cm, and 30 ( $\pm$ 1.5) kg/m<sup>2</sup>. Muscle samples were collected from the gastrocnemius and prepared for transmission electron microscopy. Relative mitochondria area, average mitochondrial size, number of mitochondria/250 $\mu$ m<sup>2</sup>, relative myofibril area, average m-line length, number of z-discs/250 $\mu$ m<sup>2</sup>, mitochondria/z-disc, relative lipid droplet area, average lipid droplet size, and number of lipid droplets/250 $\mu$ m<sup>2</sup> were measured and averaged for each participant using two-individual micrographs. All variables were statistically assessed using an independent t-test or Mann-Whitney U at a significance value of  $p < .05$ . **RESULTS:** Relative mitochondrial area ( $U=11.534$ ,  $p < .001$ ) and number of mitochondria/250 $\mu$ m<sup>2</sup> ( $t=5.343$ ,  $p < .001$ ) decreased from control to stage IV PAD. No change in average mitochondrial size was found ( $U=.371$ ,  $p=.543$ ). No difference in relative myofibril cross-sectional area ( $t=.299$ ,  $p=.384$ ) or number of z-discs/250 $\mu$ m<sup>2</sup> ( $t=-1.902$ ,  $p=.07$ ) was observed. M-line lengths were shorter for stage IV PAD patients than controls ( $U=11.543$ ,  $p < .001$ ). There was no difference in the relative lipid droplet area ( $U=1.989$ ,  $p=.158$ ), average lipid droplet size ( $t=-1.131$ ,  $p=.102$ ), or number of lipid droplets/250 $\mu$ m<sup>2</sup> ( $U=.037$ ,  $p=.848$ ). Average mitochondria/z-disc was significantly greater in controls than in stage IV PAD patients ( $t=5.737$ ,  $p < .001$ ). **CONCLUSION:** The largest changes seen in PAD skeletal muscle ultrastructure are in the mitochondria number and total mitochondria area. This decrease in mitochondria may explain altered muscle function not accounted for by hemodynamic obstructions.