

# **GASTROCNEMII STRUCTURE AND SPECIFIC TENSION IN CLAUDICANTS WITH PERIPHERAL ARTERIAL DISEASE**

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## **Introduction**

Peripheral arterial disease (PAD) is a chronic, atherosclerotic disease and often presents with intermittent claudication (IC): muscle pain brought on by muscular activity due to reduced oxygen supply and metabolite removal. PAD-IC most commonly affects the lower limbs in the elderly, limiting mobility and physical activity. The combination of disease and disuse likely impacts on muscle size, structure and quality (specific tension; ST). These musculoskeletal characteristics are important determinants of muscle strength and physical function, both of which are known to be reduced in PAD-IC (McDermott et al., 2008). The aims of this study were to determine whether the 1) size and structure, and 2) specific tension of the gastrocnemii muscles were altered with PAD-IC.

## **Methods**

The muscle (ML), tendon (TL) and fascicle (FL) lengths and pennation ( $\theta$ ) were measured at rest and during isometric MVC at optimum ML in the lateral (GL) and medial gastrocnemius (GM) of 10 controls, 7 uni-lateral and 6 bi-lateral claudicants, using ultrasonography. Volume and physiological cross sectional area (PCSA) were calculated for a combined gastrocnemii group (GS). Joint MVCs were corrected for voluntary and antagonist activation and moment arm length, and were normalised to GS PCSA to calculate ST for the combined muscle group. Between group differences were analysed using an ANOVA. Pearson's correlations were used to determine associations between disease severity, assessed using ankle:brachial pressure index, and musculoskeletal parameters.

## **Results**

No significant differences were found between groups for any structural or functional variable. With increasing disease severity, TL decreased ( $R=0.59$ ,  $p=0.02$ ) and GL and GM FL relative to TL increased ( $R=-0.70$   $p<0.001$ ). Trends towards reduced GS PCSA ( $R=0.50$ ,  $p=0.06$ ) and GL  $\theta$  ( $R=0.35$ ,  $p=0.16$ ) were evident. No relationship existed between disease severity and plantarflexion MVC ( $p=0.74$ ) or GS ST ( $p=0.85$ ).

## **Discussion**

Increasing severity of PAD-IC resulted in altered muscle-tendon structure; muscle and fibre length increased and tendon length reduced. Such adaptations may act to reduce the energy cost of active length changes, thereby attenuating the functional losses in an ischemic environment. The apparent lack of between-group differences in gastrocnemii structure may be due to a masking effect caused by the range of disease severity. In addition, the lack of an association between disease severity and ST suggests intrinsic muscle "quality" is preserved despite clear clinical progressions

in disease. Therefore the “quality” of the muscle should not be a limiting factor in the strength, function and response to training of claudicants.

## **References**

McDermott et al. (2008) J Am Ger Soc, 56, 724-9