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Biomechanical Changes in the Gastrocnemius Medius–Achilles Tendon Complex in People with Hypermobility Spectrum Disorders: A Compression Sonoelastography Study

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Abstract

Objective: Subjective diagnostic criteria associated with Hypermobility Spectrum Disorders (HSD) are a major challenge. This study aimed to objectively assess the biomechanical impact of HSD on the elasticity of the gastrocnemius medius (GM)-Achilles tendon (AT) complex using compression sonoelastography (SEG).

Methods: Using a cross-sectional design, the elasticity of the GM-AT complex was compared using SEG in an HSD group and healthy controls during rest and maximal isometric plantar flexion contraction. Beighton scores and pain visual analogue scales were assessed.

Results: The HSD group comprised 28 patients (26 women); mean \pm SD age 28.7 ± 8.4 years, compared to 28 controls (26 women); 31.5 ± 8.7 years. During rest, greater elasticity was identified in HSD relative to controls at the GM-AT musculotendinous junction (strain ratio 2.05 ± 1.31 vs. 1.48 ± 0.49), mid AT (3.60 ± 1.97 vs. 2.66 ± 1.00), and distal AT (4.57 ± 2.69 vs. 3.22 ± 1.94) (all $p < 0.05$). During contraction, no significant differences were found between groups at the GM-AT musculotendinous junction (3.40 ± 2.16 vs. 2.62 ± 1.07), mid AT (10.75 ± 5.29 vs. 8.49 ± 3.53) or distal AT (8.55 ± 5.39 vs. 8.83 ± 3.51) (all $p > 0.05$). No significant differences were found between groups in the GM strain ratio during rest (4.05 ± 1.43 vs. 3.62 ± 0.78), or contraction (4.23 ± 1.29 vs. 4.19 ± 1.31). Weak correlations were found between hip pain and GM strain ratio; $r = 0.362$ ($p = 0.008$), knee pain and GM-AT musculotendinous junction strain ratio; $r = 0.360$ ($p = 0.008$), and Beighton score and midAT and GM-AT musculotendinous junction strain ratio; $r = 0.267$ ($p = 0.047$) and 0.318 ($p = 0.017$), respectively. Receiver Operator Characteristics curve analysis suggested that strain ratio in isolation may not be diagnostic of HSD (all $p > 0.05$).

Conclusion: People with HSD have greater elasticity of the GM-AT complex. Further research is required to establish the diagnostic, clinical and research utility of strain ratio measurements.