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Relationship between skeletal muscle MRI texture parameters and areal bone mineral density (aBMD) in different athlete groups

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Background: Skeletal muscles and bones are both known to adapt to specific long-term loading. Although several studies have been conducted on the relationship between these two tissue traits in different athlete groups, the use of texture analysis (TA) methodology has not been explored. TA refers to the characterization of image textural properties by examining the spatial distribution of gray-levels within the image, and quantifying these properties. We therefore employed MRI TA to study the correlation between hip muscle texture and femoral neck aBMD in specific athlete groups.

Materials & Methods: Axial 3D T1-weighted (FLASH) images of the hip and femoral neck aBMD were obtained from the dominant leg of five distinct exercise-loading groups comprising 91 elite female athletes using a 1.5T MRI and dual energy X-ray absorptiometry (DXA) respectively. Gray-level co-occurrence matrix-based texture parameters (Angular second moment and entropy) were computed from the MRI images of gluteus maximus, gluteus medius, iliopsoas and obturator internus muscles. Correlation between aBMD and muscle texture parameters was examined in each group.

Results: Generally, low correlations were observed between muscle MRI texture parameters and aBMD. However, some moderate and significantly high correlations were also observed, especially in the high-impact and high-magnitude athlete groups.

Conclusion: MRI texture analysis could serve as a potential means to study the relationship between skeletal muscles and bone traits during specific loading. However, specific studies with a relatively larger cohort are needed in order to confirm these results.

Biography

Gabriel Nketiah is a Postgraduate student in Department of Biomedical Engineering at Tampere University of Technology and Teaching Assistant at Electronics and Communications Eng. Department. Previously he worked as Assistant MIS Officer at Jaman North Health Insurance Scheme.

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