

Association Between Modifiable and Non-Modifiable Risk Factors with Paralumbar Muscle Health in Patients with Lower Back Pain

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INTRODUCTION:

Prior studies have associated sarcopenia and fat infiltration in paraspinal muscles with lumbar pain, pathology, and poor postoperative outcomes in lumbar spine surgery. Recently, a novel magnetic resonance imaging (MRI)-based approach assessing muscle health through parameters like, Goutallier Classification (GC), and Paralumbar Muscle Cross-Sectional Area to Body Mass Index ratio (PL-CSA/BMI) showed higher muscle grades were associated with significant improvements in patient reported outcomes. The literature currently lacks studies evaluating the associations between paralumbar muscle health and age, BMI, walking tolerability, and spondylolisthesis. Our study aimed to evaluate the associations between paralumbar muscle health and age, BMI, walking tolerability, and spondylolisthesis.

METHODS:

IRB approved retrospective cohort study. Patients of the senior author who were 18 years or older that presented with back pain symptoms and received magnetic resonance imaging (MRI) of the lumbar spine within 12 months of presentation were included in this study. Patients without an MRI that could be interpreted by the authors or patients with cancer pathology or trauma-induced injuries were excluded from this study. Outcome measures included MRI-based measurements of Lumbar Indentation Value (LIV), Goutallier Classification (GC), and Paralumbar Muscle Cross-Sectional Area to Body Mass Index ratio (PL-CSA/BMI). Paralumbar muscles on axial T2-weighted lumbar MRIs were outlined using ImageJ to determine the PL-CS and lumbar indentation value through the disc spaces from L1 to L5. Goutallier Classification was determined by the primary author. A quantile regression analysis was performed for continuous variables and a negative binomial regression with estimated ancillary parameter was used for ordinal variables. The criterion for statistical significance was set at $p < 0.05$.

RESULTS:

Our analysis found that increasing age was associated with increased GC, decreased PL-CSA, and CSA/BMI at all lumbar levels. Age was associated with increased LIV at L1/L2. We found that increasing BMI was associated with increased LIV and PL-CSA and decreased CSA/BMI at all lumbar levels while it was only associated with increased GC at L1/L2, L2/L3 and L3/L4. Higher grade spondylolisthesis was associated with worse GC at all lumbar spinal levels except L3/L4 and with decreased LIV at L1/L2. An inability to walk > 1 block predicted LIV and GC at L2/L3 while predicting CSA/BMI at L4/L5. Increasing age was associated with decreased CSA at L1/L2, L2/L3 and L4/L5 while it was associated with decreased CSA/BMI and increased GC at all lumbar levels. Age was only associated with decreased LIV at L1/L2, L2/L3. Lastly, Increasing BMI was associated with increased CSA, LIV, and decreased CSA/BMI at all lumbar levels and associated with increased GC at all lumbar levels except L4/L5. All statistically significant associations had p -values < 0.05 .

DISCUSSION AND CONCLUSION:

Our analysis determined that increasing age, increased BMI, spondylolisthesis, and walking intolerability are significantly associated with poor paralumbar muscle health. Alongside these findings we discovered that increased age, BMI, spondylolisthesis and walking intolerability were significantly associated with varying degrees of increased Goutallier classification and LIV. Future research is required to determine whether there can be individual alterations in paralumbar muscle health following changes in modifiable risk factors. Additionally future efforts should focus on elucidating the impact of the underlying mechanism behind certain non-modifiable risk factors such as age on Goutallier classification and poorer paralumbar muscle health.

