Lower Hounsfield Units and Severe Multifidus Sarcopenia are Independent Predictors of Increased Risk for Proximal Junctional Kyphosis and Failure following Thoracolumbar Fusion

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INTRODUCTION: Lower Hounsfield units (HU) at upper instrumented vertebra (UIV) and severe multifidus sarcopenia will be independent predictors of an increased risk of proximal junctional kyphosis (PJK) and proximal junctional failure (PJF). The purpose of the present study was to determine demographic and radiographic variables that predict an increased risk of PJK or PJF following thoracolumbar fusion.

METHODS:

We retrospectively reviewed a cohort of patients greater than 50 years of age who underwent posterior instrumented fusion with pelvic fixation and a construct that terminated proximally between T10 to L2 between the years 2013-2020 and had at least 2 years of postoperative follow up. Patients were subdivided into three groups: 1) no PJK or PJF, 2) PJK without PJF, and 3) PJF. These subgroups were then compared based upon demographics, preoperative and 1-year postoperative sagittal alignment parameters, bone mineral density (BMD), and paraspinal sarcopenia. We utilized student's T-test and ANOVA to compare means within and between groups, respectively. Multivariable analyses were performed to determine risk factors for PJK and PJF. P values <0.05 were considered significant.

RESULTS:

We identified 150 patients for inclusion in this study with a mean age of 67.0 years and an average follow up of 32 months. The subgroup of patients with no PJK/PJF demonstrated a significantly higher HU at the UIV (148.3±34.5) than patients who developed PJK (117.8 ±41.9) or PJF (118.8 ±41.8; $P<0.001$). There was a much higher rate of severe multifidus fatty infiltration observed in patients who developed PJF (78.9%) or PJK (76.0%) than in patients who did not develop PJK/PJF (34.0%; $P<0.001$). Furthermore, no patient that developed PJK or PJF had normal multifidus quality. Multivariate analysis identified both mean UIV HU (0.80, 95% CI 0.69-0.93; $P<0.001$) and moderate-severe multifidus sarcopenia (5.40, 95% CI 1.8-16.1; $P<0.001$) as independent predictors of increased risk of PJK and PJF.

DISCUSSION AND CONCLUSION:

Patients with lower mean HU at the UIV and a higher degree of multifidus fatty infiltration are at increased risk of PJK and PJF following thoracolumbar fusions that terminate proximally between T10 and L2.