

12) TITLE: The Relationship Between Meniscal Tears and Meniscal Position

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INTRODUCTION: Meniscal tears and changes in meniscal position, namely extrusion or subluxation, are strongly associated with the progression of symptomatic knee osteoarthritis (OA). Identification of a tear type with increased risk for abnormal position may provide predictive indication of a knee at greater risk for rapid progression. The purpose of this study was to investigate the relationship between meniscal tears and meniscal position and more specifically how different types of tears and their location predispose to different patterns of meniscal position in participants with symptomatic knee OA and in age- and gender-matched controls.

OBJECTIVE: To investigate how different types of meniscal tears predispose to different patterns of meniscal position in subjects with and without symptomatic knee OA.

METHODS: One hundred sixty-one female subjects were recruited to participate in a longitudinal 24-month observational study to evaluate progression of knee OA. The subjects were divided into 2 groups, those with clinical and radiographic OA [Kellgren Lawrence Grade (KLG) 2 and 3] and controls who were asymptomatic and without significant radiographic OA (KLG 0 and 1). Coronal and sagittal knee magnetic resonance imaging (MRI) data was collected and meniscal tears were assessed using the Boston-Leeds Osteoarthritis Knee Score (BLOKS). Meniscal morphology was scored in 3 locations (body, anterior and posterior horns) on both medial and lateral menisci. Types of tears included in the analysis were vertical, horizontal, and complex tears, meniscal cysts, intrameniscal signal, and meniscal maceration. Meniscal position measures were determined for subluxation (in anterior sagittal and coronal planes), and for proportion of coverage of the meniscus. The mean values of different meniscal positions and their standard deviations were delineated for each type of tear and tear location. The overall F-test and multiple comparisons with the Tukey-Kramer method were performed to determine how different types of tears and their locations predispose to different meniscal positions.

RESULTS: Tear type was significantly associated with medial meniscal extrusion at baseline ($F = 12.24$, $p = <0.0001$). Multiple comparisons analysis revealed that maceration, meniscal cysts, and complex tears were significantly more predisposed to medial extrusion. Tear type of the medial meniscus was also significantly associated with anterior extrusion ($F = 7.79$, $p = < 0.0001$) with meniscal cysts and maceration significantly more predisposed to extrusion anteriorly. Tear type on the medial side had a significant association with proportion of coverage at baseline ($F = 4.06$, $p = <0.0001$). Maceration significantly predicted a lower proportion of coverage than intrameniscal signal ($p = 0.0003$) and normal menisci ($p = 0.0010$). With regards to the lateral meniscus, tear type was significantly associated with anterior extrusion at baseline ($F = 10.91$, $p = <0.0001$). Complex tears, meniscal cysts, and horizontal tears were associated with the greatest amounts of anterior extrusion. In consideration of tear position, a significant association was found with medial extrusion at baseline ($F = 6.57$, $p = 0.0003$). Tears of the meniscal body and posterior horn revealed significantly more medial extrusion than normal menisci ($p = 0.0001$ and 0.039 , respectively). A significant relationship was also found between tear position and anterior extrusion of the medial meniscus ($F = 10.5$, $p = < 0.0001$). Anterior horn tears had significantly more anterior extrusion than normal menisci ($p = <0.0001$) and posterior horn tears ($p = 0.0084$). Both meniscal body tears and posterior horn tears had significantly more anterior extrusion than normal menisci ($p = 0.0003$ and $p = 0.022$, respectively). None of the tear positions significantly predicted lateral extrusion, anterior extrusion, or proportion of coverage of the lateral meniscus.

CONCLUSION: More severe medial meniscal tears including maceration and complex tears predisposed to more extrusion. Laterally, only anterior extrusion was significantly affected by tear type, potentially reflecting a lower overall prevalence of lateral meniscal tears. All tear positions of the medial meniscus significantly predicted extrusion, however, this finding was not reciprocated for any of the tear positions of the lateral meniscus. These results may have important implications for arthroscopists in guiding their management of meniscal tears with the goal of slowing the progression of knee OA.

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