

Degeneration of the Meniscus and Progression of Osteoarthritis

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Introduction

A major function of the meniscus involves load bearing and shock absorption [4]. This function is provided in part through the microstructure of the menisci which contain circumferentially oriented collagen fibers woven together with radial fibers. These structures appear to act like tension rods to maintain shape and structure when axially loaded [3]. The menisci transmit anywhere from 45% to 60% of the compressive load across the knee [15]. If the meniscus does not cover the articular surface that it is designed to protect due to change in position or a tear, it will be unable to resist axial loading and will not perform this role. The absence of a functioning meniscus increases peak and average contact stresses in the medial compartment from 40% to 700% [1, 8, 11].

Meniscal Degeneration

MRI is highly accurate with high sensitivity and specificity in detecting meniscal tears, which appear as increased signal intensity extending to the meniscal articular surface. Meniscal lesions are regular findings on MRI, especially in the osteoarthritic knee. They can be in the form of: horizontal, flap, and (or) complex tears; maceration; or destruction [5]. However, asymptomatic lesions are common and frequent incidental findings on the knee MRI of the middle-aged or older patient [2].

Previous studies documented the important influence of meniscectomy on the likelihood of progressing to radiographic osteoarthritis (OA) [7, 10, 12, 14, 16]. Knee OA after meniscectomy is traditionally considered a result of the joint injury that leads to the meniscectomy in the first instance and the increased cartilage contact stress due to the loss of meniscal tissue [7, 10, 12–14, 16]. Meniscal abnormalities also predispose to progression of osteoarthritis [9] and also to incident disease [6]. We presently know little about: the risk factors for degenerate meniscal tears; the natural history of mucoid meniscal/intrasubstance alteration; and the timing of meniscal damage with regards to OA development.

Summary

Our understanding of the role that meniscal degeneration plays in the natural history of OA of the knee would benefit from observational studies that address the natural history of intrasubstance signal change with compositional pathologies, the clinical significance of different meniscal pathologies, and the relation of meniscal alteration to altered contact area and joint loading. In addition, the weak evidence base for many of the current treatments suggests a great need for well-designed, randomized, controlled clinical trials to assess the true effects of arthroscopic meniscal resection, meniscal repair or transplantation, or nonsurgical treatments.

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