

Meniscal Tear — A Common Finding with Often Troublesome Consequences



Osteoarthritis (OA) is an increasingly important health concern in most developed countries¹. The knee is one of the most commonly affected sites, and the symptoms often start by middle age or even earlier. Typically, we fail to recognize the disorder until irreversible morphological joint changes have occurred, e.g., loss of joint cartilage and meniscal maceration and extrusion indicated by the loss of joint space on plain radiographs.

In this issue of *The Journal* Rytter and colleagues present their third report in a series assessing the knees of floor layers and graphic designers, i.e., one group with a profession involving frequent and prolonged kneeling and change from kneeling to standing and the other involved in less knee-straining activity². Floor layers have been associated with increased frequency of radiographic knee OA³. However, the current report focuses not on knee OA per se but on the structural integrity of the menisci.

The menisci are 2 wedge-shaped discs positioned in each tibiofemoral compartment and are vital for shock absorption and load transmission during dynamic joint movements⁴. When the knee is loaded, the meniscus distributes stress over a large area of the articular cartilage. The present study is important because it suggests that certain occupational knee load (not actual pivoting knee trauma) is associated with a high frequency of meniscal tears — tears that, in turn, are a potent risk factor for development of knee OA whether surgery is performed or not^{5,6}. The meniscal tear may thus represent an important intermediate in the causal chain of events between high occupational knee load and the development of knee OA.

In the Rytter study, the investigators determined meniscal status using state of the art magnetic resonance imaging (MRI). MRI is an increasingly popular diagnostic procedure for meniscal tears, with a sensitivity and specificity in the range of 82% to 96% using visual inspection and probing at arthroscopy as the gold standard⁷. The researchers assessed both knees of 92 male floor layers and 49 male graphic designers, mostly middle-aged, using the latter as a reference group. The crude prevalence of tibiofemoral OA based on full-thickness cartilage loss on MRI was similar in both

groups, just above 10%. The graphic designers reported somewhat higher frequency of participation in knee-straining sports and previous knee injury. Still, the crude prevalence of meniscal tear was higher in the group of floor layers, of whom 67% had a medial meniscal tear versus 53% of the graphic designers, yielding the odds ratio 2.3 adjusted for age, body mass index, and knee-straining sports. While the prevalence may seem surprisingly high in both groups, it does not deviate much from that found in the general population in Framingham, Massachusetts (Figure 1)⁸. Additionally, the reader should keep in mind that the odds ratio is inflated due to the high prevalence of meniscal tear, which makes the odds ratio difficult to interpret; an alternative approach would have been the calculation of prevalence ratios⁹.

Why so many people unknowingly walk around with meniscal tears in their knees is not known, but it is conceivable that the menisci undergo molecular and ultrastructural changes with age where they lose some of their delicate properties. It is plausible that the frequent kneeling and squatting in floor layers may be an example of an environmental risk factor needed to make an already aging and possibly degeneratively changed meniscus tear, at least earlier than expected. Repetitive high loads and associated micro-trauma may simply accelerate the meniscal degradation and eventually exceed the threshold for tearing. The location of the tears was typically in the posterior horn of the medial meniscus, in line with peak pressures in deep knee flexion and restricted medial meniscal movements^{10,11}. Interestingly, in previous parallel observations, prolonged squatting is a strong risk factor for knee OA in elderly Chinese subjects¹², and occupational squatting/kneeling and heavy lifting are associated with joint cartilage defects in male US Veterans Administration patients¹³.

Nevertheless, we should interpret the findings of the Rytter study with caution. First, we do not know that there is an actual causal association between high occupational knee loads and meniscal tears. Further, there is a concern regarding the relatively small study sample. A random sample of those subjects consenting to the clinic visit was

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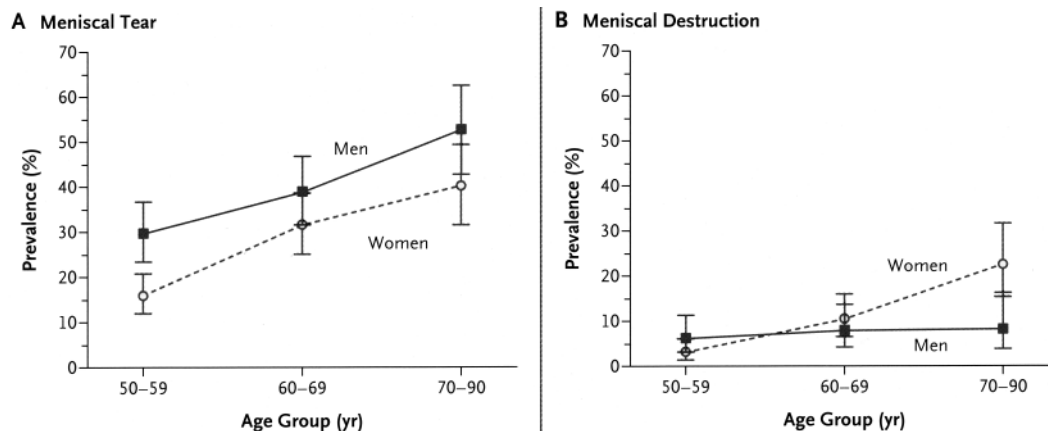


Figure 1. Prevalence of meniscal damage in the right knee among the 426 men and 565 women from the general population of Framingham, Massachusetts. From Englund, et al. *N Engl J Med* 2008;359:1108-15⁸. Copyright Massachusetts Medical Society.

selected for knee MRI. However, the somewhat low and differential participation ratio to the clinic visit may have introduced selection bias (out of the original cohort established from the trade union rosters, 55% of floor layers versus 41% of graphic designers, $p < 0.001$, consented to participate in the clinic visit). The graphic designers had a greater tendency to participate if knee symptoms were present, while no such tendency was found among the floor layers. However, as discussed in the article, if anything, this would most likely introduce bias in the direction of finding more meniscal tears in graphic designers than expected. Similarly, the “healthy-worker effect” among the floor layers implies that healthy persons tend to go into and remain in the trade, introducing bias in the direction of finding fewer meniscal tears in floor layers than expected. Therefore, even with differences between the 2 groups the study can probably be seen as a conservative estimate of the true difference in prevalence.

While there is an association between knees with meniscal tears and knee symptoms in subjects without radiographic knee OA using a large dataset, most meniscal tears exist in individuals without knee symptoms⁸. The findings by Rytter and colleagues corroborate these findings (the presence of knee symptoms among study subjects with or without meniscal tear was about equal). It is important to recognize that even in subjects with knee symptoms and meniscal tear it is not necessarily the meniscal tear per se causing the patient’s discomfort. Preliminary data indicate, however, that loss of meniscal function may trigger other pathways of joint discomfort, possibly as part of an early osteoarthritic process¹⁴. Hence, the meniscal tear is not an innocent bystander. The altered biomechanical properties of the knee with increased cartilage contact stress and possible synovial activation may with time lead to subchondral bone changes and painful bone marrow edema¹⁵.

Thus, when seeing patients with symptoms possibly attributable to meniscal tears, we need to consider both the

short and long term. Data have recently shown that persons with meniscal damage without surgery are at high risk of developing knee OA⁵; but we also know that there is no evidence that current surgical techniques reduce this risk¹⁶. Partial meniscectomy is one of the most common surgical procedures performed by orthopedic surgeons in the US, with up to 1 million arthroscopies per year and about 50% in middle-aged or older patients¹⁷. Considering that meniscal tears are present in about one-third of all knees of persons above 50 years of age in the general population, surgery is obviously not the treatment of choice for all of them. Even in painful knees, surgery is a questionable alternative in this age category^{8,18}. The only randomized controlled trial (RCT) has shown no effect of surgery on short-term outcome¹⁸, and results from RCT of arthroscopy in patients with knee OA, usually also involving meniscal resections, have failed to prove that surgery is more efficacious than sham surgery or physiotherapy alone^{19,20}. There is a great need to sort out the true effects of meniscal surgery in the middle-aged or elderly in the short and long term, as well as to develop effective measures to prevent the occurrence of meniscal tears.

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