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CORR Insights®: Knee Muscle Strength After Recent Partial Meniscectomy Does Not Relate to 2-year Change in Knee Adduction Moment

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Where Are We Now?

This important paper by Hall and colleagues explores the potential relationship between the knee's muscle strength and knee degenerative arthrosis after partial medial meniscectomy. Knee adduction moment, as measured during gait analysis, is a

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surrogate for medial compartment loading and has been associated with both radiographic disease progression and knee pain. Peak knee adduction moment relates the peak force generated during walking and is velocity dependent. Impulse knee adduction moment is the average midstance value of the knee adduction moment. It is clear that knee adduction moment increases after partial medial meniscectomy [1, 3]. Cross-sectional evidence suggests that the knee adduction moment may be greater with weak knee extensors [3]. Despite this background, the authors were unable to find an improvement in peak or impulse knee adduction moment with increasing strength in patients 30 to 50 years of age postmeniscectomy. The peak knee adduction moment increased 9% from the baseline assessment. Impulse knee adduction moment was unchanged from baseline.

Although this is important work, the current study had some important limitations. The authors did not present any outcomes data (such as pain scores), so we do not know the relationship of increasing knee adduction moment to knee pain after meniscectomy. The power analysis was performed after data collection, therefore the study was not designed to have a large enough study population to detect a difference in the primary outcome of knee adduction moment. The amount of clinically important knee adduction moment is unknown. The muscles tested are primarily sagittal-plane functional, whereas knee adduction moment is more of a coronal-plane phenomenon. As the authors acknowledge, other muscles such as medial gastrocnemius may be more important to control knee adduction moment.

Where Do We Need To Go?

While there is an association between knee adduction moment and knee osteoarthritis after knee meniscectomy, the role of knee adduction moment

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after partial medial meniscectomy has yet to be determined. As always, diagnostic findings need to be carefully correlated with symptoms, specifically pain. As the authors note in their limitations, there may be more appropriate muscles to measure.

Similarly, the association between partial meniscectomy and same compartment osteoarthritis is not completely understood. Is the relationship between altered joint contact forces causative? Could the meniscectomy alter the proprioceptive capabilities? The small amount of knee laxity resulting from meniscectomy may contribute to the degenerative changes [2]. Biochemical changes have been detected in joints with osteoarthritis. Does meniscectomy contribute to the pathologic joint milieu? [5]. Perhaps this is simply natural history. Osteoarthritis is common in cadaver dissections, and meniscus tearing may be due to age-related joint changes.

The investigation explores a potentially modifiable variable in knee adduction moment. However, based on this investigation, knee flexor and extensor strengthening does not appear to be important in controlling knee adduction moment. While this investigation did not offer a modifiable solution to knee adduction moment after partial meniscectomy, in the next section we hope to offer some

opportunities to gain further insights into an important and vexing issue.

How Do We Get There?

In order to improve validated self-reported outcome measures, we must accurately discriminate between patients with differing outcomes that do not have the ceiling effect of some of the presently used measures. Investigators clarifying the relationship between meniscectomy and same compartment osteoarthritis could use these tools. MRI, particularly delayed gadolinium enhanced MRI of cartilage, may be useful in a longitudinal fashion to define the impact of the altered joint contact forces after meniscectomy. Areas of cartilage loss or alteration can be compared to known areas of contact force concentration. As measurement of joint laxity improves, subtle laxity or abnormal joint motion may shear articular cartilage. Similarly, MRI would be of value for this application. Further synovial fluid research and cartilage biopsies will elucidate the biochemical impact of the meniscectomy on the joint [5].

On a topic related to this investigation, Hall and colleagues, the same group that authored this investigation, have registered a Level I study proposing to compare physiotherapy with and without neuromuscular training as

treatment for patients after meniscectomy who are 30 to 50 years of age [4]. Neuromuscular training is a multiplane activity that may directly and notably impact knee adduction moment after partial meniscectomy. Surface electromyography, commonly used in gait analysis, may target muscles for future intervention.

Osteoarthritis and its etiology are treated with a multimodal approach after partial meniscectomy. Its relationship to knee adduction will need a multifaceted approach.

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