ARTHROSCOPIC PARTIAL MENISCECTOMY VERSUS NONOPERATIVE THERAPY IN THE TREATMENT OF DEGENERATIVE MENISCUS TEARS

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ABSTRACT

**Objective:** To determine the efficacy of arthroscopic partial meniscectomy versus nonoperative therapies in the treatment of degenerative meniscus tears in adults 35 years of age and older.

**Design:** Systematic literature review.

**Methods:** Primary searches were done in PubMed and New England Journal of Medicine, using key search terms including meniscectomy, degenerative meniscus tears, conservative, physical therapy, and long term outcomes. Within both search engines the following limits were set: humans, English, publication within past 5 years, full text, randomized control trials, adults: >35 years.

**Results:** The Yim et al. study was included due to its examination of both meniscectomy and nonoperative treatment for degenerative meniscus tear and the use of a standardized exercise and medication regimen in both groups. The demographics of the two groups in this study were highly comparable. The Katz et al. study was included secondary to its large, multicenter, randomized controlled trial assessing symptomatic patients 45 years or older with meniscus tears. The Sihvonen et al. study was included as it was a double blinded study assessing symptomatic patients with meniscus tears and optimal treatment outcomes.

**Conclusion:** Arthroscopic partial meniscectomy provided no long term relief in functional status or pain after 12 months when compared to the conservative treatment of a physical therapy regimen.
Arthroscopic Partial Meniscectomy Versus Nonoperative Therapy in the Treatment of Degenerative Meniscus Tears

Arthroscopic partial meniscectomy is the most commonly performed orthopedic procedure in the United States. An arthroscopic partial meniscectomy (APM) is performed when there is evidence of a meniscus tear. Degenerative meniscus tears are insidious in onset, typically occur in those over 30 years of age, and can be asymptomatic. Currently, surgery is offered to those with a degenerative meniscus tear experiencing knee pain with mechanical symptoms. Mechanical symptoms include clicking, popping, locking, and catching. The number of APMs performed annually continues to rise and in fact have increased nearly 50% between 1996 and 2006. This impressive rise of procedures performed is partly due to increasing population growth and demand, but it is also the result of an inadequate compilation of available data.

A 2012 email survey questioned orthopedic specialists and determined the three most important clinical factors resulting in a surgeon's decision to operate on a degenerative meniscus tear: failure of nonoperative treatment, a positive physical exam, and the presence of degenerative radiographic findings. The survey ultimately determined that significant variation exists among surgeons regarding the decision to perform APM. Currently, there is no consensus on an evidence-based treatment of choice; practitioners continue to question whether operative or nonoperative treatment yields better short- and long-term results, particularly for those aged 30 and over and those with baseline evidence of osteoarthritis. New evidence suggests degenerative meniscus tears are a sign of early knee osteoarthritis and not a separate clinical problem.

Because of this, whether or not APM for degenerative tears is as efficacious as previously thought is a topic of much debate. The goal of this study is to compile evidence and determine the efficacy of the traditional treatment (arthroscopic partial meniscectomy) and compare it with nonoperative therapy. Refer to Table 1 for clinical question development.

<table>
<thead>
<tr>
<th>Table 1. PICO Development</th>
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<tr>
<td>Population</td>
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<td>Intervention</td>
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<td>Comparison</td>
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<td>Outcome</td>
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Clinical Question
Do patients aged 35 and older with degenerative meniscus tears experience long term benefits from undergoing arthroscopic partial meniscectomy as primary treatment?
METHODS

A preliminary search of PubMed and New England Journal of Medicine (NEJM) was performed in September 2016. Key search terms for PubMed included meniscectomy, degenerative meniscal tears, conservative, physical therapy, and long term outcomes. Limits set to the search were as follows: humans, English, publication within past 5 years, full text, randomized control trials, adults: >35 years. This search produced 109 articles, 16 of which were further screened, providing one eligible article covering meniscectomy and non-operative treatments for degenerative meniscus. A similar search was conducted through NEJM. The same search terms and limits were set. This search produced 12 articles, 7 of which were further screened, providing two eligible articles covering meniscectomy and non-operative treatments for degenerative meniscus. Full text articles that were excluded did not have the population, sample size, or publication date desired for this study.

Table 2. Study Criteria

<table>
<thead>
<tr>
<th>Study</th>
<th>Inclusion Criteria</th>
<th>Exclusion Criteria</th>
</tr>
</thead>
</table>
| Yim et al.¹ (Study 1) | - Daily knee pain on the medial side  
- Mechanical symptoms  
- Affected daily living activities  
- Prior management attempts at a primary clinic during the previous month | - History of definite trauma  
- Previous knee surgery  
- Ligament deficiency  
- Systemic arthritis  
- Osteonecrosis  
- Kellgren-Lawrence classification >2 |
| Katz et al.² (Study 2) | - > 45 years of age  
- Symptoms for at >1 month, managed with one or more of: medications, activity limitations or PT  
- Mechanical symptoms  
- Evidence on knee MRI or plain radiography of OA  
- Evidence on knee MRI of a meniscal tear that extends to the surface of the meniscus  
- Willingness to undergo randomization and ability to understand and sign an informed consent document | - Chronically locked knee (e.g. patient cannot flex or extend the knee; a clear indication for APM)  
- Kellgren-Lawrence Grade 4  
- Inflammatory arthritis or clinically symptomatic chondrocalcinosis  
- Injection with viscosupplementation in past four weeks in index knee  
- Contraindication to surgery or physical therapy  
- Bilateral symptomatic meniscal tears  
- Prior surgery on index knee |
| Sihvonen et al.³ (Study 3) | - Age: 35 to 65 years  
- Persistent (> 3 months) pain on the medial joint line of the knee  
- Pain provoked by palpation or compression (forced flexion) of the medial tibiofemoral joint line or a positive McMurray sign | - Obvious trauma-induced onset of symptoms  
- Locked knee or decreased range of motion of the knee  
- Previous surgical procedure on the affected knee  
- Clinical knee OA (ACR Criteria)  
- Kellgren-Lawrence grade > 1  
- Acute (within the previous year) fracture of the affected extremity |
Treatment of Degenerative Meniscus Tear

- MRI showing signals characteristic of medial meniscus injury
- Arthroscopically-verified degenerative medial meniscus tear
- Instability of the knee
- MRI assessment shows pathology other than degenerative knee disease requiring treatment other than APM
- Arthroscopic examination reveals pathology other than a degenerative injury to the medial meniscus requiring intervention other than APM

RESULTS

Study #1

A Comparative Study of Meniscectomy and Nonoperative Treatment for Degenerative Horizontal Tears of the Medial Meniscus. Yim et al.1

Study Objective

To compare the clinical results of arthroscopic meniscectomy and non-operative treatment for degenerative horizontal tears in the posterior horn of the medial meniscus.

Study Design

This is a randomized controlled trial of 102 participants. Participants were referred to the Center for Joint Disease at Chonnam National University Hwasun Hospital in Jeonnam, Korea, between January 2007 and July 2009 for treatment of non-traumatic knee pain. Patients with knee pain and a degenerative horizontal tear of the posterior horn of the medial meniscus were included. MRI was used to identify tears of the posterior horn of the medial meniscus and teleoroentgenography (x-ray) was used to measure preoperative mechanical axes of the lower extremity. Inclusion and exclusion criteria are outlined in Table 2.

Of 162 eligible patients, 108 agreed to participated in the study. A closed envelope technique was used to determine subsequent treatment of the participants. Participants were divided into two groups; one to be treated non-operatively and one to undergo arthroscopic meniscectomy. Fifty-four patients were randomized to each group. In total, the study included 81 women and 21 men, the average age was 56.8. Baseline body mass index, mechanical axis, and degrees of maximal flexion were comparable in both groups.

Prior to the conclusion of the study, 1 member of the meniscectomy group and 1 member of the nonoperative group were lost to follow up, 3 members of the meniscectomy group underwent an addition procedure, and 1 member of the nonoperative group underwent surgery. Management of the nonoperative group included drugs, formal physical therapy, and a home exercise program. Prescriptions for either analgesics, nonsteroidal anti-inflammatory drugs (NSAIDs), or muscle relaxants were provided depending on the patients’ initial symptoms. Formal physical therapy with a licensed physical therapist consisted of 60 minute sessions, 3 times per week, for 3 weeks with a goal of improving muscle strength, flexibility, and endurance. After 3 weeks, patients were provided with instructions for a home exercise program that they continued for 8 weeks. They were instructed to do daily isometric and isotonic muscle exercises with strain but little pain.

Participants placed in the meniscectomy group underwent arthroscopic meniscectomy by a single experienced orthopedic surgeon. The procedure consisted of resection with limited debridement of the articular surface lesion with a 5.5-mm, 30° arthroscope and a pressure-controlled irrigation system. Patients were discharged the day of surgery and allowed to use
analgesics or NSAIDs for 2 weeks following. They were instructed to follow the same home exercise program as the nonoperative group for 8 weeks. Outcomes were measured clinically using a number of techniques. A visual analog scale (VAS) considering pain related to specific activities (i.e. stair climbing, squatting, standing up, and sitting down). The Lysholm knee score and Tegner activity scale were used. The Lysholm knee questionnaire addresses the following symptoms: limp, pain, support, swelling, locking, instability, and difficulty with squatting and stair-climbing. The Tegner score measures ability to perform physical activity. For both questionnaires, lower scores indicate more severe symptoms. Patient rated their satisfaction with their management as “very satisfied” (treatment met expectations”, “satisfied” (treatment helped, and the patient would undergo this treatment option), or “dissatisfied” (patient was the same or worse than prior to management). The Kellgren-Lawrence classification was used to grade osteoarthritic changes on x-ray; a score of greater than or equal to 2 exemplifies definite osteophytes or definite joint space narrowing on plain radiography.

A minimum of fifty-four patients in each group was estimated to be adequate for 80% power and a P value <0.5. Analysis of this study was performed using Statistical Package for the Social Sciences (SPSS) software package; the Student t test was used for numeric data and the x² test was used for nonnumeric data. The Student t test is a statistical technique used to compare two sets of numerical data and determine the probability that the two populations are the same with respect to the variable of interest. The x² test does a similar thing with nonnumeric data and determines the probability that an observed difference occurred by chance.

**Study Results**

Clinical outcomes and physical exam results were measured and conducted at 3 months, 1 year, and 2 years by independent authors not involved in treatment. At the 2-year follow up, the VAS scores for the meniscectomy group was 1.8 and for the nonoperative group was 1.7. The VAS scoring system is based on a continuum where a score of 0 or 1 was classified as complete relief, 5 signified moderate pain, and 10 unbearable pain. The VAS scoring outcomes were not significant. For the meniscectomy group and non-operative group respectively, knee pain with mechanical symptoms were completely relieved in 34 and 35 patients, improved in 13 and 12 patients, and persistent in 3 and 5 patients; no significant difference was observed.

Satisfactions results were as follows: for the meniscectomy group, 18 were very satisfied, 28 were satisfied, and 4 were dissatisfied, for the nonoperative group, 17 were very satisfied, 29
were satisfied, and 6 were dissatisfied. Lysholm knee scores were not significant at 83.2 for the meniscectomy group and 84.2 for the nonoperative group at two years.

The only significant difference was seen at 3 months with Lysholm knee scores of 85.2 (meniscectomy group) and 80.4 (nonoperative group). The average Tegner activity scores at 2 years were 5.1 in the meniscectomy group and 4.9 in the nonoperative group. Using the Kellgren-Lawrence classification, 2 patients in the meniscectomy group and 3 patients in the nonoperative group showed osteoarthritis progression by more than 1 grade over the period of the study.

Study Critique

Strengths include the use of standardized exercise plans and medication regimens similar in both groups. The two groups in this study were highly comparable. Only one surgeon performed all of the surgeries, bringing continuity to a typically variable experience. Numerous outcomes were measured, providing a thorough overarching picture of the patient’s clinical status before and after treatment.

Disadvantages of the study include the fact that the majority of outcomes measured were subjective; clinical data was acquired using questionnaires. Historically there is poor correlation between objective data and subjective complaints. Furthermore, by excluding patients with a Kellgren-Lawrence classification score of greater than or equal to 2, a large population with degenerative meniscus tears were excluded. Two patients in the nonoperative group and 4 patients in the meniscectomy group were lost to follow up or underwent additional procedures prior to the 2-year follow up.

The statistical significance of the 3 month Lysholm knee scores proved to be only statistically significant and not clinically significant. Three months later the scores had evened out and were not clinically significant at 6 months, 1 year, and 2 years. Further long term follow up of patients would be prudent. Additionally, it is worth noting that this study took place in Korea and the patient population is likely very different from that in the United States in terms of comorbidities, daily physical activities, previous healthcare, and lifestyle.

Study #2
Surgery versus Physical Therapy for Meniscal Tear and Osteoarthritis. Katz et al.2

Study Objective
To provide a large, multicenter, randomized, controlled trial to examine the efficacy of arthroscopic partial meniscectomy (APM) in patients positive for symptoms associated with a meniscal tear and evidence of mild to moderate knee osteoarthritis (OA) via imaging as compared to a standardized physical therapy regimen.

Study Design
This study involved 351 patients, 45 years of age or older with symptoms associated with a meniscus tear for greater than 1 month that persisted despite pharmacological treatment, physical therapy, or rest and evidence of mild to moderate knee osteoarthritis on imaging. It was a large, 7 center, randomized controlled trial that was not blinded. The 351 patients were randomly assigned to surgery or a standardized physical therapy regimen. The groups were similar in respect to age, sex, race or ethnic group, baseline Western Ontario and McMaster Universitis Osteoarthritis Index (WOMAC) physical function scores (ranging from 0-100, with
higher scores indicating more severe symptoms) and baseline Kellgren-Lawrence grade of radiographic severity, a score of greater than or equal to 2 exemplifies definite osteophytes or definite joint space narrowing on plain radiography.

Coordinators at each site reviewed outpatient schedules to identify possible patients. The surgeons also assessed possible patients and referred them to the study if they met the criteria. Once the 351 patients were selected they were randomly assigned using a secure program that stratified according to sex and the extent of OA on baseline radiography. The patients were then informed of their group assignment. The surgeons were informed of the patient group assignments.

Standardization of both the surgical procedure and physical therapy regimen was created and implemented at all the sites. All surgeons had completed a fellowship and previously done greater than 50 APMs per year. The standardized physical therapy regimen was created by experienced physical therapist and based off of evidence based medicine and individualized home regimens for each patient. Both groups were allowed to use acetaminophen and NSAIDs as needed. Intraarticular injections of glucocorticoids were also used throughout the duration of the trial.

Study Results
An initial mean improvement in the WOMAC physical function score from baseline at 6 months was identified in the individuals who underweight the randomizes APM (20.9 points). The physical therapy group also saw an improvement, however slightly less (18.5 points). As shown in Figure 4 below, the original authors concluded that these results did not show a statistical significance between the groups. Secondary outcomes were scored based on pain using the Knee Injury and Osteoarthritis Outcome Scale (KOOS) which showed a mean decrease of 24.2 points for the surgical group versus 21.3 points for the physical therapy group from their baseline at 6 months. The KOOS pain score was noted to be the same for both groups at 12 months, again showing no statistical difference between the groups.

At 12 months, a total of 59 of the patients in the physical therapy group had crossed over within the study and underwent APM, totaling a 35% crossover rate. To account for this crossover, they created an additional outcome which was defined as an improvement of at least 8 points on the WOMAC scale. If this was present they were determined to have successful outcomes. The individuals originally assigned to the physical therapy group who crossed over to surgery did not have substantial improvement in functional status from start of the study until time of crossover.

The physical therapy group had an average of 9.3 physical therapy visits and attended an average of 8.4 visits. Of the surgical group they were scheduled for an average of 7.4 visits and attended 6.9 visits. During these visits, 21 patients received intraarticular glucocorticoid injections, 9 of who were from the surgical group. Overall the difference in functional improvement from baseline to 6 months did not significantly improve based on the Kellgren-Lawrence grade.

Study Critique
Strengths of this study include a large number, multicenter, randomized controlled trial setting. This study's limitations are that the treatment assignments were not blinded, leading to a higher crossover rate, which was never fully discussed as a limitations to their study in their self-critique section. They also only enrolled 26% of eligible patients, due to patients with a strong
preference to receive the surgery, creating selective enrollment leading to a potential bias and inability to extrapolate the general population. Other limitations include the fact that the setting was restricted to academic referral centers, making it a potentially different patient population than community settings.
Figure 4. Scores on the WOMAC Physical-Function Scale and KOOS Pain Scale over the 12-Month Followup Period.²
Panel A shows the scores on the physical-function scale of the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), and Panel B shows the scores on the pain scale of the Knee Injury and Osteoarthritis Outcome Scale (KOOS); scores on both scales range from 0 to 100, with higher scores indicating more severe symptoms. I bars indicate 95% confidence intervals. Panel C shows WOMAC physical-function scores in the APM group and in the PT group according to crossover status. The asterisk indicates that nine patients assigned to APM did not undergo surgery.²

Figure 5. Primary Outcomes in the Partial Meniscectomy group and the Sham-surgery Group.³
Lysholm knee scores (Panel A), Western Ontario Meniscal Evaluation Tool (WOMET) scores (Panel B), and scores for knee pain after exercise (Panel C) over the 12-month follow-up period are shown. Lysholm knee scores and WOMET scores range from 0 to 100, with lower scores indicating more severe symptoms; scores for knee pain after exercise range from 0 to 10, with higher scores indicating more severe pain. I bars denote 95% confidence intervals. A single value was missing for one patient in the sham-surgery group at the 6-month follow-up and for one patient in the partial-meniscectomy group at the 12-month follow-up; these
Study #3
*Arthroscopic Partial Meniscectomy versus Sham Surgery for a Degenerative Meniscal Tear. Sihvonen et al.*

**Study Objective**

To evaluate the effectiveness of arthroscopic partial meniscectomy (APM) for middle aged adults with degenerative meniscal tear as compared to conservative treatment, at 12 months after the procedure.

**Study Design**

This was a multicenter, randomized, double-blind, placebo controlled study assessing patients aged 35-65, who were positive for greater than 3 months of knee pain associated with a degenerative meniscal tear and no osteoarthritis of the knee present. The study had 205 patients eligible for enrollment, 59 of which were excluded. The remaining 146 patients were randomized into two groups; 70 to undergo APM and 76 to undergo sham surgery, both with similar baseline characteristics. There was no loss to follow-up within the study. Inclusion and exclusion criteria noted in Table 2.

Patients were selected over a 6-year period from December 2007 to January 2013 to undergo a randomized, double-blind study assigning them operative treatment (APM) or conservative treatment consisting of a diagnostic arthroscopy, both followed by OTC analgesics as needed for pain and a home exercise program. Patients were randomized amongst the two groups by a statistician via stratifications according to the study size, age, sex and the absence or presence of minor degenerative changes on a radiograph. The statistician had no involvement in the clinical care of patients within the trial. Orthopedic surgeons and other staff in operating room were unaware of the group assignments until time of surgery. Protocol for APM involved the removal of damaged and loose parts of the meniscus. The sham surgery was conducted in the same manner as far the pre and post op procedures are concerned. To simulate an APM, patients undergoing the sham procedure were kept in the operating room for the same amount of time required for a true APM. Both groups were allowed over-the-counter analgesic agents, had the same post-operative care, and were provided with the same education regarding the at-home physical exercise program.

The outcomes measured included two primary outcomes: knee pain after exercise which was assessed on an 11-point scale ranging from 0 (no pain) to 11 (extreme pain) and the Lysholm knee score and WOMET score at 12 months after surgery, both graded on a scale of 0-100, with 0 indicating worse symptoms and 100 indicating the absence of symptoms. The Lysholm knee score is a validated, condition specific scoring questionnaire that assess both pain activity based on a 8 section. These same outcomes were assessed at 2 and 6 months to help assess the trajectory of treatment response. Questionnaires were administered at baseline and at 2, 6, and 12 months following surgery. A writing committee was developed and a double blinded review was conducted of the primary outcome. Secondary and other outcomes being evaluated included the frequency of need for subsequent knee surgery or an increase in serious adverse events.

**Study Results**

Improvements were seen in both groups from baseline to 12 months, however no significant difference between the groups were measured. The mean between-group difference
in improvement in the Lysholm knee score was -1.6 points (95% confidence interval [CI], -7.2 to 4.00, that in the WOMET score was -2.5 points (95% CI, -9.2 to 4.1) and that in the score for knee pain after exercise was -0.1 points (95% CI, -0.9 to 0.7). As shown in Figure 5 above, the original authors concluded that there was also no difference found in the outcomes assessed.

**Study Critique**

The strengths include the straightforward goal of assessing whether the APM is effective in ideal situations. The inclusion criteria included patients with degenerative medial meniscus tears and no OA. The surgeons used were highly experienced. The patients and those collecting data were blinded from what treatment they were receiving.

Limitations to the study includes a potential for bias given the end results of knee pain are subjective. The duration of home exercise program/follow up to assure patient compliance is not clearly stated in article or supplemental article. It is also possible that the patients enrolled had knee osteoarthritis but that it was not apparent with the clinical and radiological criteria used for diagnosis.

<table>
<thead>
<tr>
<th>Study</th>
<th>Yim et al.¹</th>
<th>Katz et al.²</th>
<th>Sihvonen et al.³</th>
</tr>
</thead>
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<tr>
<td>Year</td>
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<td>2013</td>
</tr>
<tr>
<td>Country</td>
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<td>Finland</td>
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<tr>
<td>Mean age, year</td>
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<td>Male sex %</td>
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<td>76</td>
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<td></td>
<td>NSAIDS, 3 week supervise physical exercise followed by 8 week home exercise</td>
<td>Land-based, individualized physical therapy with progressive home exercise</td>
<td>Sham surgical procedure</td>
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<tr>
<td>Surgical</td>
<td>50</td>
<td>161</td>
<td>70</td>
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<td></td>
<td>Arthroscopic meniscal debridement</td>
<td>Arthroscopic meniscal debridement</td>
<td>Arthroscopic meniscal debridement</td>
</tr>
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<td>Major Outcome</td>
<td>Lysholm Knee Scoring Scale, WOMET, VAS, 15D, patient satisfaction scores at 2, 6, 12 months</td>
<td>WOMAC-pf, KOOS pain scale, SF-36 physical activity scores at 3, 6, 12 months</td>
<td>Lysholm Knee Scoring Scale, WOMET, VAS, 15D, patient satisfaction scores at 2, 6, 12 months</td>
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<td>OA Inclusion</td>
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<td>Kellgren–Lawrence grade 0–3</td>
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<tr>
<td>Loss to follow</td>
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</tr>
<tr>
<td>up</td>
<td></td>
<td>S: 1/161</td>
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</table>

**DISCUSSION**

Arthroscopic partial meniscectomies (APM) are the most commonly performed orthopedic procedure in the United States.⁴ Degenerative meniscus tear is a common source of pain and functional impairments for many middle-aged patients. The goal of surgical treatment is to decrease pain, improve function, and prevent degenerative osteoarthritis of the involved knee.¹⁰ Recent studies suggest that degenerative meniscal tears may be a sign of early knee osteoarthritis and as a result, APMs produce no long term improvement in decreasing pain or
improving function, as surgery does not reverse or prevent the progressive process of osteoarthritis. A 1995 article published in the American Journal of Sports Medicine determined that undergoing an APM greatly increases the likelihood of developing osteoarthritis of the knee. Furthermore, meniscus tears themselves are also associated with accelerated progression of osteoarthritis of the knee.

Recently published literature shows no significant long-term improvement in pain and function scores of those undergoing an APM compared to those undergoing physical therapy alone. As shown in Table 4, the three studies included in this systematic review all confirm that APM is not a superior treatment option for degenerative meniscal tear.

Yim et al, a randomized control trial of 102 participants, concluded there were no significant differences between patients undergoing APM and patients undergoing nonoperative therapy at two years post treatment. This study measured outcomes based on a visual analog score, Lysholm knee score, Tegner activity scale, and patient satisfaction. Strengths of the study include the use of standardized exercise plans, highly comparable demographics among the two groups, a sole operating surgeon, and a wide variety of outcomes measured. Disadvantages of the study include that the majority of outcomes measured were subjective. Furthermore, unlike Katz et al, patients with a Kellgren-Lawrence osteoarthritis classification score of greater than or equal to 2 were excluded. In doing so, the study did not accurately represent a population commonly affected by degenerative meniscus tears and subjected the study to possible bias.

Katz et al examined patients with evidence of a meniscal tear and mild-to-moderate osteoarthritis. They were randomly assigned to surgery with post-operative physical therapy or to a standardized physical-therapy program. Evaluations were done at 6 and 12 months; both showed no significant difference between the groups in primary outcomes of function and pain relief. This study had the largest sample size, was randomized, and involved multiple centers. It utilized an established physical therapy regimen created by certified physical therapists to prompt optimal outcomes. The downfalls of the study included a high cross over rate of 35% from the nonsurgical group to the surgical group, and unlike Sihvonen et al it was not blinded, potentially leading to a bias for both patients and surgeons. Only 26% of eligible patients were included as many declined participation; it is questionable that the study representative of the general population.

The last study, Sihvonen et al, was a randomized, multicenter, double-blinded, sham-controlled trial. This study looked at patients with symptoms of a degenerative medial meniscus tear without evidence of knee osteoarthritis. They also showed no significant differences between the two groups in both pain and functional improvement; positive improvements were seen in both the surgical group and nonsurgical group. A smaller sample size of 146 patients was utilized in their study. However, the use of a sham surgery control for the non-operative group allowed for continuity and the potential for more accurate outcomes than Yim et al and Katz et al who did not include a sham surgery for their

![Lysholm Knee Score Comparison](image)
nonsurgical group. Positive outcomes in the sham-controlled group are likely due in part to the placebo effect.

All of these studies looked at degenerative meniscus tears; however, Katz et al knowingly included patients with mild to moderate knee osteoarthritis. Patients in this study may have falsely experienced a decreased benefit from the interventions. It was difficult to assess outcomes across all three studies due to the variety of measurement tools used. See Table 4 for a complete list of outcomes measured.

Given the extent to which APMs are performed annually, continued evidence that surgical intervention shows no improvement in the long-term outcomes for middle-aged adults with degenerative meniscal tears is needed. The authors of this paper are hopeful orthopedic surgeon support and trust in the improved outcomes demonstrated after a standardized non-operative physical therapy regimen will grow as more data is compiled. Since there is no difference in outcomes we believe first line treatment for degenerative meniscus tears should be a nonoperative.

Table 4. Outcome of Trials

<table>
<thead>
<tr>
<th>Study</th>
<th>Outcome</th>
<th>Meniscectomy Group</th>
<th>Nonoperative Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yim et al.</td>
<td>Lysholm knee Score at 2 years</td>
<td>83.2</td>
<td>84.3</td>
</tr>
<tr>
<td></td>
<td>Visual Analog Scale Score</td>
<td>1.8</td>
<td>1.7</td>
</tr>
<tr>
<td>Katz et al.</td>
<td>WOMAC physical-function score at 1 year</td>
<td>13.7</td>
<td>14.5</td>
</tr>
<tr>
<td></td>
<td>KOOS pain score at 1 year</td>
<td>19.1</td>
<td>19.3</td>
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<tr>
<td></td>
<td>SF-36 physical-activity score at 1 year</td>
<td>69.0</td>
<td>71.4</td>
</tr>
<tr>
<td>Sihvonen et al.</td>
<td>Lysholm knee score at 1 year</td>
<td>82.2</td>
<td>83.4</td>
</tr>
<tr>
<td></td>
<td>WOMET score at 1 year</td>
<td>81.0</td>
<td>79.9</td>
</tr>
<tr>
<td></td>
<td>Knee pain after exercise at 1 year</td>
<td>2.7</td>
<td>2.9</td>
</tr>
</tbody>
</table>

CONCLUSION

More than 700,000 arthroscopic partial meniscectomies are performed yearly in the United States, with an annual income in direct medical costs of nearly $4 billion. An increasing number of studies show that, in the treatment of degenerative meniscus tears, combined APM and physical therapy are not providing superior relief of pain and functional status when compared to physical therapy alone; this is confirmed within our systematic review.

A well-adhered-to physical therapy regimen is shown to be an effective treatment option for middle aged adults with non-traumatic, degenerative meniscal tears. At 12 months post-treatment, there is no significant benefit to undergoing an APM compared to physical therapy alone in relation to patient satisfaction, functional status of the knee, and pain. Further studies need to be done regarding the relationship between degenerative meniscus tears and osteoarthritis. Since the research suggests a structured physical therapy regimen seems to provide similar outcomes and fewer risks than the now commonly performed APM, continued support for a standardized physical therapy regimen and duration of therapy would be necessary to make this the mainstay treatment.

Acknowledgements

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REFERENCES:


