ORIGINAL ARTICLE

The Treatment of Non-Traumatic Meniscus Lesions

A Systematic Review Comparing Arthroscopic Partial Meniscectomy With Non-Surgical Treatment

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SUMMARY

Background: Most meniscus lesions are of non-traumatic origin. The indications for partial meniscectomy are controversial.

Methods: We systematically searched the literature for randomized controlled trials (RCTs) comparing partial meniscectomy with non-surgical treatment.

Results: Of 6870 articles retrieved by the literature search, we were able to include six in this systematic review. Five trials showed no difference between the clinical outcomes of patients who underwent arthroscopic partial meniscectomy and those who underwent control treatment (arthroscopic lavage, physiotherapy, glucocorticoids). In three trials, however, symptoms improved in 21–30% of the patients in the physiotherapy group only after they underwent arthroscopic partial meniscectomy (crossover design). In two trials, the percentage of patients who crossed over from one treatment arm to the other was markedly lower; in one, the frequency of crossing over was not reported. In one RCT, the patients who underwent arthroscopic partial meniscectomy had significantly less pain and other symptoms. Five of the six trials had acceptable scores for method, but all had weaknesses. These mainly concerned the description of the surgical techniques and the failure to take account of analgesic use—in particular, the use of non-steroidal anti-inflammatory drugs (NSAIDs).

Conclusion: For most patients with non-traumatic meniscus lesions, surgical and non-surgical treatments seem to be of equal value; only one of the six included trials revealed lower pain and symptom scores after arthroscopic partial meniscectomy. In multiple trials, however, the crossover analysis showed that non-surgical treatment fails for some patients. These patients may benefit from arthroscopic partial meniscectomy. Further trials are needed to better define this subgroup of patients.

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Meniscal tears can cause pain or locking of the knee joint and prevent those affected from participating in sporting activities, while at the same time reducing their quality of life (1–5). Radiological studies have shown that osteoarthritis can be a long-term consequence of meniscal injury (2, 6–8).

The majority of meniscal injuries occur without adequate trauma (3, 4, 9). The prevalence of non-traumatic meniscus lesions is 31% according to the Framingham study (9). Arthroscopic partial meniscectomy has been the first-line treatment for these injuries for a long time (3, 4, 10–12) and positive clinical outcomes have been demonstrated for this procedure in several cohort studies (10–12).

Partial meniscectomy has become one of the most common orthopedic procedures due to the high prevalence of non-traumatic meniscus lesions in the general population and the widespread use of magnetic resonance imaging (MRI) which can detect these tears (13–16). According to DRG (diagnosis-related groups) statistical data, approximately 300 000 meniscus surgeries were performed in German hospitals in 2013 (17).

The Finnish Degenerative Meniscal Lesion Study (FIDELITY), a randomized controlled trial, showed that the outcomes after arthroscopic partial meniscectomy were not superior to those after sham surgery (18, 19). This study was covered widely in the media and doubts were raised concerning the efficacy of arthroscopic partial meniscectomy (14). Prompted by these media reports, health insurers and healthcare organizations have already questioned the benefits of arthroscopic partial meniscectomy (14). However, weaknesses of the FIDELITY study were demonstrated by various authors (20). These flaws included the low inclusion rate of just 15% and that the control group was treated with arthroscopic lavage instead of proper sham surgery (20).

The aim of this review is to systematically analyze all available randomized controlled trials evaluating the efficacy of arthroscopic partial meniscectomy in patients with non-traumatic lesions.

Since previous non-randomized studies have demonstrated benefits for a surgical treatment of meniscus lesions (10–12), we put forward the hypothesis that there is a subgroup of patients that benefit from surgery.

Review of the literature and search results

FIGURE

Methods

Search details

Between September 30, 2014 and December 22, 2014, a systematic search in the PubMed database was performed in accordance with PRISMA guidelines to identify articles related to the treatment of non-traumatic meniscus lesions (21, 22). This study was prospectively registered (www.crd.york.ac.uk/PROSPERO; no.: CRD4201401–3957).

For the literature search, several keywords were used: meniscus, arthroscopic partial meniscectomy, meniscus surgery. The references of any matching studies identified were reviewed to find further relevant publications. The primary search was conducted by one of the authors (WP).

Inclusion and exclusion criteria

The inclusion criteria for this systematic review were:

- Prospective randomized trials (level 1)
- Meniscus lesion
- Studies reporting clinical outcomes after arthroscopic partial meniscectomy
- English-language articles
- Publication in a peer-reviewed journal
- Minimum follow-up period of one year.

The eligibility of publications was assessed on the basis of their abstracts. Where the abstract indicated that the study met the inclusion criteria, the entire article was read. In a joint conference it was decided

whether a study was accepted and analyzed or rejected (reviewers: WP, AA, SK). Studies not meeting all inclusion criteria were excluded from this review. There were no limitations regarding the date of publication. All three reviewers had to agree upon the inclusion of a study. Articles based on earlier systematic reviews and meta-analyses were not excluded.

Analysis

Where two separate studies of the same authors but with different follow-up periods were identified, only the study with the longer follow-up period was included (21). However, duplicate publications, appendices and study design–related publications were used for the purpose of methodological analysis.

Primary and secondary end points

The following primary endpoints were analyzed:

- Clinical scores
 - Knee Injury and Osteoarthritis Outcome Score (KOOS)
 - Lysholm Score
 - Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC)
 - Western Ontario Meniscus Evaluation Tool (WOMET)
 - Visual Analogue Scale (VAS)
- Switch rates (patients who switched between the two treatment groups).

TABLE 1

Information about the design of the included randomized studies

First author and year of publication	Number of study centers	Country	Group and patient number for follow-up	Control treatment	Last follow-up [years]	Average age (years)	BMI (mean)	Male/female	Degree of osteoarthritis for inclusion	Questionnaires
Herrlin et al. 2013 (26)	1	Sweden	A: 45 C: 47	Physiotherapy	5	A: 54 C: 56	A: 26 C: 26	A: 28 / 19 C: 30 / 19	Grade I (Ahlbäck)	KOOS (PE) Tegner (SE) Lysholm (SE) VAS (SE)
Yim et al. 2013 (29)	1	Korea	A: 50 C: 52	Physiotherapy	2	A: 55 C: 58	A: 25 C: 26	A: 9 / 41 C: 12 / 40	Grade 0–I (K&L)	Lysholm ^{*1} VAS Tegner
Katz et al. 2013 (27) (+ study design protocol)	7	USA	A: 161 C: 169	Physiotherapy	1	A: 59 C: 58	A: 30 C: 30	A: 71 / 90 C: 72 / 97	Grade 0–III (K&L)	WOMAC – ADL (PE) KOOS Pain (SE) SF-36 (SE)
Shivonen et al. 2013 (18) (+ study design protocol)	5	Finland	A: 70 C: 76	Arthroscopic lavage	1	A: 52 C: 52	A: 27 C: 28	A: 42 / 28 C: 47 / 29	Grade 0–I (K&L)	Lysholm (PE) ^{*2} WOMET (PE) Knee pain questionnaire (PE) EQ-15D (SE)
Vermesan et al. 2013 (28)	1	Romania	A: 60 C: 60	IA steroid injection	1	A: 59 C: 58	A: 33 C: 32	A: 11 / 49 C: 14 / 46	Not mentioned	Oxford knee questionnaire
Gauffinet al. 2014 (14)	1	Sweden	A: 75 C: 75	Physiotherapy	1	A: 54 C: 54	Not mentioned	A: 53 / 22 C: 56 / 19	Grade 0 (Ahlbäck)	KOOS Pain (PE) KOOS Symptoms, QOL, Sport, ADL (SE) EQ-5D (SE) VAS (SE) PAS (SE) Symptom satisfaction scale (SE)

PE, primary endpoint; SE, secondary endpoint; FU, follow-up; A, arthroscopy; C, control; IA, intra-articular; K&L, Kellgren & Lawrence; KOOS, Knee Injury and Osteoarthritis Outcome Score; QOL, Quality of Life; ADL, Activities of Daily Living; VAS, Visual Analogue Scale; WOMAC, Western Ontario and McMaster Universities Osteoarthritis Index; SF-36, Short-Form Health Survey-36; WOMET, Western Ontario Meniscal Evaluation Tool; BMI, body mass index; EQ-5D, EuroQol-5D; EQ-15D, EuroQol-15D. The Lysholm questionnaire is not validated for Korean^{*1} and Finnish^{*2}.

TABLE 2

Inclusion and exclusion criteria

First author and year of publication	Inclusion criteria	Exclusion criteria
Herrlin et al. 2013 (26)	<ul style="list-style-type: none"> – Age: 45 to 64 years – Daily knee pain during the last 2 to 6 months and clinical symptoms/signs indicative of medial meniscus lesion; negative trauma history – MRI shows medial meniscus lesion – Patients understand Swedish 	<ul style="list-style-type: none"> – Traumatic meniscus injury – Knee osteoarthritis according to Ahlbäck classification – Neurological or rheumatic condition – Loose bodies, ligament injuries, osteochondral defects and tumors (MRI) – Knee surgery during the last year – Hip or knee prosthesis – Leg fracture during the last year – Contraindication for physical training
Yim et al. 2013 (29)	<ul style="list-style-type: none"> – Daily medial knee pain with mechanical symptoms, affecting activities of daily living despite treatment in a primary care hospital during the previous months 	<ul style="list-style-type: none"> – Relevant trauma history – Previous knee surgery – Ligament insufficiency – Systemic arthritis or osteonecrosis – Degenerative changes grade 2 or higher (Kellgren Lawrence)
Katz et al. 2013 (31)	<ul style="list-style-type: none"> – Age: 45 years or older – At least 4 weeks of symptoms treated with one of the following options: medication, restricted activity – Symptoms indicative of meniscus lesion (e.g. locking, clicking, snapping, giving way of the knee, knee pain with rotation or sideways movements, intermittent knee pain, acute knee pain located in the joint space) – Availability of knee radiographs and MRI – Evidence of osteophytes or full-thickness cartilage defect in MRI; or native radiographs with evidence of osteophytes or joint space narrowing – Evidence of meniscus lesion in MRI, extending to the surface of the meniscus – Patient consent to randomization, the understanding of the study and the signed consent 	<ul style="list-style-type: none"> – Chronically locked knee (e.g. patient cannot undo locking; clear indication for arthroscopic partial meniscectomy) – Kellgren-Lawrence grade 4 (advanced knee osteoarthritis) – Inflammatory arthritis or symptomatic chondrocalcinosis – Intra-articular injection of viscosupplement into the affected knee during the last 4 weeks – Contraindication for surgery or physiotherapy – Bilateral symptomatic meniscus lesion – Previous surgery on the affected knee
Shivonen et al. 2013 (19)	<ul style="list-style-type: none"> – Age: 35 to 65 years – Knee pain at the medial joint space persisting for longer than 3 months – Pain triggered by palpation or pressure (with forced knee flexion) at the medial joint space or positive McMurray test – MRI shows signal changes characteristic of medial meniscus lesion – Arthroscopically verified degenerative lesion of the medial meniscus 	<ul style="list-style-type: none"> – Clearly trauma-induced onset of symptoms – Locked knee (that cannot be extended normally) – Previous knee surgery of the affected knee – Clinical knee osteoarthritis (according to the criteria of the American College of Rheumatology) – Radiological knee osteoarthritis (Kellgren-Lawrence grade >1) – Acute (during the last year) fracture of the affected leg – Reduced range of motion of the knee – Knee instability – MRI shows a pathology requiring treatment other than arthroscopy – Arthroscopic examination shows pathology requiring another arthroscopic partial resection of the medial meniscus than the one for degenerative medial meniscus lesions
Vermesan et al. 2013 (28)	<ul style="list-style-type: none"> – Atraumatic symptomatic knee with degenerative changes of the medial compartment (cartilage or meniscus) in MRI 	<ul style="list-style-type: none"> – Not mentioned
Gauffin et al. 2014 (14)	<ul style="list-style-type: none"> – Age: 45 to 64 years – Symptom duration for more than 3 months – Standing radiographs with Ahlbäck grade 0 – Previous physiotherapy – Patients understand Swedish 	<ul style="list-style-type: none"> – Locked knee or recurrent locking of knee more often than once per week – Rheumatic or neurological conditions, fibromyalgia – Endoprosthesis of the hip or knee joint – Contraindication for outpatient surgery in the study hospital – BMI >35 or a severe disease

BMI, body mass index; MRI, magnetic resonance imaging

TABLE 3

Clinical outcome of the randomized studies included in the review

Author and year of publication	Clinical outcome	Cross-over
Herrlin SV 2013 (26)	Both groups showed significant clinical improvements in the KOOS score, Lysholm score, and VAS at the month 24 and month 60 follow-up visits. In addition, no differences between the two groups were found for the Tegner score at 24-month and 60-month follow-up visits.	Approx. one third of the patients receiving non-surgical treatment alone (27.7%) showed no improvements in the point values of the clinical scores. After switch to the arthroscopy group, the scores improved to the same level as in the original arthroscopy group.
Yim JH 2013 (29)	Both groups showed significant clinical improvements in the Lysholm score, Tegner score, and VAS at all follow-up visits without differences between the groups. At the 3-month follow-up visit, the Lysholm score results were significantly higher in the treatment group than in the control group.	Not stated
Katz JN 2013 (27)	Both groups showed significant clinical improvements at the 3-month, 6-month, and 12-month follow-up visits in KOOS, VAS and WOMAC physical function. No differences between the groups were found.	At the 6-month follow-up visit, 51 patients of the group with primary conservative treatment (30.2%) had undergone arthroscopic partial meniscectomy. After 6 to 12 months, further 8 patients (4.7%) had undergone arthroscopic partial meniscectomy.
Shivonen R 2013 (19)	Both groups showed significant clinical improvements at the 6-month and 12-month follow-up visits in the Lysholm score, WOMAC score and pain score after weight bearing (VAS), as well as the 15D.	One patient of the arthroscopy group and 5 patients of the control group underwent arthroscopy. One patient in the treatment group underwent secondary implantation of a prosthesis.
Vermesan D 2013 (28)	After one month, 12 patients in the steroid group und 7 patients in the arthroscopy group experienced symptom recurrence. Furthermore, after one month, the patients in the arthroscopy group had a significantly better Oxford score. After 12 months, there was no longer a difference between the two groups. Meniscus extrusion, bone marrow edema, duration of clinical symptoms, overweight, and a low preoperative Oxford score were negative prognostic factors.	After one year, 10 patients had undergone arthroscopic debridement which improved symptoms in 7 cases. After one year, 6 patients had undergone total knee replacement surgery.
Gauffin H 2014 (14)	KOOS Pain: Improvements from baseline after 3 and 12 months. Reduced pain after 3 and 12 months in the surgery group. In both groups, older patients showed more significant improvements than younger patients. KOOS Symptoms: Less symptoms in the surgery group after 12 months. Total KOOS: The changes from baseline to the 3-month and 12-month follow-up period were significantly higher in the surgery group compared with the conservative treatment group. EQ-5D: No difference PAS: Significant difference from baseline to 12-month follow-up period in both groups. Symptom Satisfaction Scale: Significant difference between baseline and 12-month follow-up period in both groups	16 patients switched from the conservative treatment to the surgical treatment group (21%). 9 patients (12%) allocated to the surgical treatment group refused to undergo surgery.

KOOS, Knee Injury and Osteoarthritis Outcome Score; VAS; Visual Analogue Scale; WOMAC, Western Ontario and McMaster Universities Osteoarthritis Index; 15D, health-related quality-of-life instrument made up of 15 dimensions and scored on a scale of 0 (death) to 1 (full health); EQ-5D, EuroQol-5D; PAS, Physical Activity Scale

Secondary endpoints included:

- Subgroup analysis for factors influencing the outcome after partial meniscectomy
- Radiological outcome
- Rate of adverse effects
- Methodological analysis of included studies.

Study quality was assessed using the Jadad scores (23), Coleman methodology score (24) and the CONSORT checklist (CONSORT, consolidated standards of reporting trials) (25). For detailed information about these scores, see the supplementary *eMethods*.

Limitations

A systematic analysis of the following processes which may be associated with limitations was performed:

- Description and standardization of the surgical technique
- Control of surgical process quality
- Exclusion of other surgical interventions
- Evaluation of the use of analgesics, including nonsteroidal anti-inflammatory drugs (NSAIDs)
- Evaluation of the use of intra-articular corticosteroids.

For a detailed description of the methodology, see *eMethods*.

Results

Search results and study design

The search results are shown in the *Figure*. Detailed information about the study designs is provided in

TABLE 4

Quality assessment using the Jadad score (23), Coleman methodology score (24), and the CONSORT checklist (25)*

Author and year of publication	Jadad score (points)	Coleman methodology score (points)	CONSORT checklist (number of items)
Herrlin et al. 2013 (26)	3	83	21
Yim et al. 2013 (29)	2	88	16
Katz et al. 2013 (27)	3	91	30
Shivonen et al. 2013 (19)	5	95	31
Vermesan et al. 2013 (28)	1	49	8
Gauffin et al. 2014 (14)	3	85	34

* Jadad scores range from 0 to 5 points. A score of less than 3 points indicates poor study quality. The Coleman methodology score analyzes study quality based on 10 criteria. Scores range from 0 (worst score) to 100 (best score). The CONSORT statement includes a 37-item checklist.

Table 1. The inclusion and exclusion criteria of the six studies analyzed are listed in *Table 2*.

In the FIDELITY study, six patients were excluded due to false-positive MRI findings (19). Gauffin et al. (14) reported ten false-positive MRI findings in the arthroscopy group. In other studies, no false-positive MRI findings were reported (26–29).

Clinical outcomes

At the time of study inclusion, no differences between the clinical scores in the compared groups were found in any of the studies (*Table 3*).

At the last follow-up examination, five studies found no statistically significant differences in clinical outcomes between patients treated surgically and non-surgically (*Table 3*). However, in one study patients treated with arthroscopic partial meniscectomy had significantly less pain (KOOS Pain subscale) after three and twelve months and less symptoms (KOOS Symptoms subscale) after twelve months (14). The KOOS Pain subscale was used as a primary endpoint in two further studies. In these studies, no differences were observed after one and five years (26, 27).

In all three studies, the rates of switches from the physiotherapy group to the arthroscopy group were analyzed (*Table 3*). These switch rates were 21% (14), 27.7% (26) and 34.9%, respectively (27). In the Gauffin study, two patients switched from the physiotherapy group to the arthroscopy group within the first three months and 14 patients in the period from month 4 to month 12 (14). In the METEOR study, 51 patients switched within the first six months from the physiotherapy group to the arthroscopy group (30.2%), while eight patients (4.7%) switched during the period from month 6 to month 12 (19).

Two studies reported that the clinical scores prior to the switch had not improved compared with those at the start of the study (26, 27). Herrlin et al. (26) revealed that patients who switched had significantly

poorer scores in the KOOS subscales Pain, Sport/Rec and Quality of Life, as well as in the Lysholm score and on the visual analogue scale for pain (during activity). Likewise, in the METEOR study (24) patients who switched had shown no improvement in the WOMAC (physical function) score. After surgery, their scores improved to the same level observed among patients who underwent primary partial meniscectomy (26, 27).

Subgroup analysis

Subgroup analyses were performed in four studies to evaluate the impact of factors with the potential to influence the outcome after partial meniscectomy. The clinical outcome was neither influenced by the degree of osteoarthritis (19, 27) nor by the presence of locking symptoms (14, 27).

Adverse effects

Analyses for adverse effects were undertaken in three studies. None of these studies showed differences in the rate of adverse effects (14, 19, 27).

Radiological outcome

Only two studies reported on the progression of osteoarthritis. These studies found no differences in osteoarthritis progression between the two treatment groups (arthroscopy or physiotherapy) (26, 29).

Study quality and limitations

Table 4 shows the results of the study quality analysis incorporating the Jadad score, Coleman score (methodology) and the CONSORT checklist.

Table 5 shows the results for the classification of the control of surgical process quality, the exclusion of other surgical treatments, the use of analgesics, including NSAIDs, and of corticosteroids. A major limitation was that none of the studies controlled for the use of pain medications, including NSAIDs (*Table 5*).

The use of non-specific and non-validated scores in the studies included in this review were another relevant limitation (for example, Lysholm, WOMAC and Oxford Knee Score [OKS]). Further limitations are described in the *eMethods*.

Discussion

In this systematic review, only one study demonstrated advantages of arthroscopic partial meniscectomy over treatment with physiotherapy (14). All other studies found no differences between the treatment groups (19, 26–29).

However, the analysis of the patients who switched groups revealed a subgroup with a non-traumatic lesion of the medial meniscus which did not benefit from physiotherapy but from arthroscopic partial meniscectomy (14, 26, 27). These findings confirm our initial hypothesis. In two studies reporting a significant switcher rate, the reason for switching to the arthroscopy group was that symptoms persisted under physiotherapy (26, 27). Following arthroscopic partial

TABLE 5

Control of surgical process quality and evaluation of the use of analgesics and NSAIDs

Author and year of publication	Quality control of the surgical procedure	Exclusion of other surgical procedures	Evaluation of the use of analgesics and NSAIDs	Evaluation of the use of intra-articular corticosteroids
Herrlin et al. (2013)	B	C	C	C
Yim et al. (2013)	B	B	C	C
Katz et al. (2013)	B	B	C	A
Shivonen et al. (2013)	B	A	C	C
Vermesan et al.(2013)	C	C	C	A
Gauffin et al. (2014)	C	C	C	C

NSAIDs, nonsteroidal anti-inflammatory drugs; A, high quality; B, moderate quality; C, poor quality

meniscectomy, clinical outcomes improved to the same level as observed in patients who underwent primary arthroscopic partial meniscectomy.

Apparently, the types of meniscal tear have an impact on the response to surgical and non-surgical treatment. The only study not reporting a switcher rate included only patients with horizontal meniscus lesions (29). This indicates that horizontal lesions show good response to non-surgical treatment (29). Herrlin et al. (26) investigated the types of tears present in patients who switched from the physiotherapy group to the arthroscopy group. In their study, 8 of 13 switchers had flap tears. Flap tears are associated with a risk for mechanical symptoms. These observations show that patients with flap tears benefit from arthroscopic partial meniscectomy.

In the study of Gauffin et al. (14), all patients had to be treated preoperatively with physiotherapy. Consequently, patients selected for this study would rather not have responded to physiotherapy.

In the subgroup analyses of the various studies, the outcome was not influenced by age (14), the presence of mechanical symptoms (locking) (14), the stage of osteoarthritis (19, 27), or the acute onset of symptoms (14, 19).

It remains unclear whether partial meniscectomy or the meniscus lesion itself is a risk factor for the development of osteoarthritis. The study of Herrlin et al. (26) showed no difference between the osteoarthritis rates in the treatment groups and the majority of patients showed no osteoarthritis progression (26). After five years, two patients in each treatment group experienced progression of osteoarthritis (26). These findings are in conflict with the findings of other studies (6, 7). However, they indicate that patients do not develop osteoarthritis as the result of arthroscopic partial meniscectomy. The meniscus lesion is rather a complication of medial knee osteoarthritis (30, 31).

Study quality analysis yielded acceptable results for five of the studies included in this review. Only one study had poor results in all three scores (28). Its results should be interpreted with caution.

Limitations

In some studies, the description of the surgical technique is worthy of criticism. Since intraoperative complications, such as iatrogenic injury to cartilage and resection of too much or too little meniscal tissue, influence the postoperative result, unclear description and standardization of the surgical technique used is of concern (32, 33). Additionally, further arthroscopic interventions, such as shaving of articular cartilage, notchplasty and partial synovectomy, were only excluded in the FIDELITY study (19). Another point of concern is that there was no control of surgical process quality in any of the studies included in this review. Future randomized controlled studies evaluating surgical treatments should include these factors.

Another weakness is that the use of pain medication, including NSAIDs, was not documented in any of the studies analyzed. Thus, the results in either of the two treatment groups could have been masked by the use of NSAIDs. The gastrointestinal side effects of NSAIDs are well known (34).

A further shortcoming of the studies analyzed is the lack of generalizability which is a typical limitation of randomized controlled trials. Of all eligible patients, only 26% could be included in the METEOR study and only 15% in the FIDELITY study. Hence, caution is advised when applying the results to the population as a whole (27).

Another point of concern is that in three studies the Lysholm score was used as a primary endpoint. This score is not validated for two of the national languages (Finnish and Korean) commonly spoken in the respective studies. In addition, Briggs et al. showed that the Lysholm domains of limp, instability, support, and locking had excessively high ceiling effects (>30%) for meniscus injuries (35). Similarly, floor effects were described for KOOS when it was used among patients with meniscus injuries (36).

Further limitations included lack of information about the distribution of prognostic factors, such as extrusion, subchondral edema, varus malalignment, and root injuries (37–39).

This systematic review has some limitations too. Because of the heterogeneity of the scores used in the studies, no meta-analysis could be performed. In addition, the low number of included studies (only six randomized controlled trials [RCTs]) could be considered a limitation which may introduce a systematic bias. Further clinical studies are needed to more precisely characterize the subgroup of patients benefiting from arthroscopic partial meniscectomy. With regard to the evaluation of treatment variables, we focused on the surgical treatment group. For physiotherapy, similar difficulties were found. Gauffin et al. (14) reported that only 53% of patients completed the exercise diary and on average only 19 of 24 training sessions were actually performed. It should also be noted that all analyzed articles were focused on the medial meniscus. No conclusion can be drawn regarding the treatment of lateral meniscus lesions.

Conclusion

At first sight, the included studies seem to show no difference between the results after arthroscopic partial removal of the medial meniscus and non-surgical treatment—even though one of the six studies reported less pain and symptoms in the group after arthroscopic partial meniscectomy. However, 21 to 30% of patients appear to have benefitted from arthroscopic partial meniscectomy after physiotherapy had failed. There is evidence that some patients with flap tears fall into this group. In future studies, the subgroup of patients who benefit from surgery should be more clearly defined.

Due to the variability of the publications on this topic, it is not possible to reach a clear conclusion at present.

Conflict of interest statement

Prof. Petersen has patents and royalties of Karl Storz and Otto Bock. He has received consultancy fees from Karl Storz, Otto Bock and AAP Implantate. Furthermore, he has received lecture fees from AAP Implantate.

The other authors declare that no conflict of interest exists.

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KEY MESSAGES

- Most patients with non-traumatic medial meniscus lesions can be treated non-surgically.
- There is a not further defined subgroup for which physiotherapy is not as successful as expected. These patients may benefit from arthroscopic partial meniscectomy.
- There is evidence that some patients with flap tears fall into this subgroup. Flap tears can trigger mechanical symptoms.
- The studies included in this review had methodological shortcomings.
- Future studies evaluating orthopedic surgical treatments should use validated and specific scores and document the use of analgesics.

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Supplementary material
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www.aerzteblatt-international.de/15m0705

Supplementary material to:

The Treatment of Non-Traumatic Meniscus Lesions:

A Systematic Review Comparing Arthroscopic Partial Meniscectomy With Non-Surgical Treatment

by Wolf Petersen, Andrea Achtnich, Christian Lattermann and Sebastian Kopf

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eMETHODS

Material and methods

Study quality and limitations

Method scores—The Jadad score is the only validated score to evaluate study quality (23). The Jadad score is focused on randomization, blinding and withdrawals/dropouts. The Coleman methodology score was developed for orthopedic questions. This score also covers factors such as description of the surgical technique and rehabilitation (24). The CONSORT checklist consists of 25 items, covering the design, analysis and interpretation of randomized controlled trials (25).

Control of surgical process quality—The method section of the articles was assessed as to whether the authors had attempted to control how the surgical procedure was performed. The following categories were used:

- Standardization of the surgical intervention in all trial centers and quality control of the surgical intervention by the study physician or another person. Intraoperative documentation (photos, videos) can be used for control purposes.
- Standardization of the surgical interventions at all study centers, but without control of surgical process quality.
- No standardization of the surgical interventions.

Exclusion of other arthroscopic interventions—The exclusion of other arthroscopic interventions was categorized as follows:

- No interventions other than partial meniscectomy were permitted during arthroscopy.
- In addition, removal of intra-articular loose bodies or partial synovectomy were permitted.
- No exclusion of other interventions (e.g. microfracturing)

Evaluation of the use of analgesics, including non-steroidal anti-inflammatory drugs (NSAIDs)—The articles were assessed as to whether the authors had evaluated the use of analgesics (including NSAIDs), given the potential impact of the use of analgesics on the results in the treatment groups. The studies were classified as follows:

- Analgesics (including NSAIDs) were permitted, but their use was documented.
- Analgesics (including NSAIDs) were not permitted.

- Analgesics (including NSAIDs) were permitted, but their use was not documented.

Evaluation of the use of intra-articular corticosteroids—The studies were analyzed as to whether the authors had evaluated the use of intra-articular corticosteroid injections, given the potential impact of this intervention on the results in the treatment groups. The studies were classified as follows:

- Corticosteroids were permitted, but their use was documented.
- Corticosteroids were not permitted.
- Corticosteroids were permitted, but their use was not documented.

Further limitations

The article was checked for further potential limitations by all three reviewers. Where a potential limitation was identified, it was documented and discussed between the three reviewers. The limitation was accepted when all three reviewers agreed upon it.

Results

Limitations

Table 5 shows the results for the classification of the control of surgical process quality, the exclusion of other surgical treatments, the use of analgesics (including NSAIDs) and of corticosteroids. Only one study permitted other surgical interventions in addition to partial meniscectomy (19). Minor additional measures, such as the removal of intra-articular loose bodies or cartilage fragments, as well as partial synovectomy were permitted in two studies (27, 28).

Two studies reported the use of corticosteroids (27, 28). In one of these two studies, intra-articular corticosteroid injection was the treatment in the control group (28). In the other (27), 12.4% of the patients in the physiotherapy group received additional intra-articular corticosteroid injections compared with 5.6% in the arthroscopy group.

Other limitations included:

- Selection bias in randomized trials
- Missing information about limitations
- No information about extrusion
- No information about subchondral edema
- No information about the prevalence of varus mal-alignment.