

Knee osteoarthritis: when arthroscopy can help

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KEY WORDS

arthroscopy, knee,
meniscus,
osteoarthritis

ABSTRACT

Arthroscopic surgery of the knee is one of the most common orthopedic procedures performed globally. Recently, a lot of attention has been directed towards the role of arthroscopic surgery in the setting of osteoarthritis (OA) and its role in degenerative knee pathology. A number of recent randomized control trials and systematic reviews have suggested limited benefit for arthroscopic surgery and partial meniscectomy for this indication. With this recent focus on the use of arthroscopy in OA, it is often forgotten that arthroscopy plays an important role in the management of other pathologies involving the knee in patients who may have a concomitant diagnosis of OA. This evidence-based review highlights indications for when arthroscopic intervention is warranted in such patients.

Introduction Osteoarthritis (OA) is the most common form of arthritis and is characterized by loss of articular cartilage, joint space narrowing, and subchondral bone sclerosis. Clinically, it presents with pain, effusion, and limited motion.¹ Knee OA is the most common source of knee pain in those aged 50 years or older, and as such it is associated with a high global health and economic burden.² OA will become the fourth leading cause of disability by the year 2020 according to a recent report by the World Health Organization.³ Symptomatic knee OA affects over 10 million adults in the United States, and over 80% of individuals with radiographic evidence of knee OA have a concomitant finding of a degenerative meniscal tear.^{4,5} With an aging population and increase in obesity globally, it is anticipated that the burden of OA will become a significant issue worldwide.⁶

Conservative treatment options include oral and topical anti-inflammatory medications, weight loss, bracing in selected cases, as well as physiotherapy and various knee injectable treatments. Such injectable treatments commonly include intra-articular cortisone, viscosupplementation, and upcoming treatments, such as combination therapies and biological treatments, including platelet rich plasma. The use of arthroscopic surgery in patients with OA has been an area of recent interest and research.

Arthroscopic surgery for osteoarthritis and degenerative meniscal tears

Arthroscopic surgery is commonly performed in patients with concomitant varying levels of OA. In this setting, it is the most commonly performed orthopedic procedure, with an estimated cost of 3 billion USD annually in the United States alone.^{7,8} Each year, over 700 000 arthroscopic knee procedures are performed in the United States and over 150 000 in the United Kingdom. Of these procedures, over 350 000 partial meniscectomy procedures are performed to treat meniscal pathology presumed to be the cause of symptoms in patients with coexisting radiographic findings of knee OA.⁹

The utilization of arthroscopic surgery for degenerative knee disease has been the focus of a number of recent randomized controlled trials (RCTs) and high-quality systematic reviews and meta-analyses.¹⁰⁻¹⁸ While clinical practice guidelines agree that arthroscopic debridement or lavage is not indicated as a treatment in patients with OA, recent evidence suggests that also arthroscopy may not be beneficial for patients with chronic degenerative meniscal tear in the setting of OA.^{11,19}

A recent systematic review by Siemieniuk et al¹¹ produced a strong recommendation against the use of arthroscopy in patients with degenerative knee disease, emphasizing the importance of fully utilizing appropriate conservative treatment options. In particular, the recommendations

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Received: January 21, 2018.

Revision accepted: January 22, 2018.

Published online: January 22, 2018.

Conflict of interest: none declared.

Pol Arch Intern Med. 2018;

128 (2): 121-125

doi:10.20452/pamw.4186

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directed clinicians to maximize exercise therapy, as clinical outcomes of surgery were no better than would be expected from a full course of physiotherapy. Another systematic review of 8 RCTs evaluating arthroscopic surgery in the setting of degenerative meniscal tears found moderate evidence to suggest no clinical benefit of arthroscopic meniscal debridement for degenerative meniscal tears in comparison with non-operative or sham treatments in middle-aged patients with early OA.¹⁰ Despite this, there are a number of settings in which arthroscopy plays an essential role in patients who also have varying degrees of concomitant OA.

Acute meniscal pathology Arthroscopic surgery and partial meniscectomy is an effective treatment option in patients with acute meniscal pathology. Acute pathology is considered after a specific traumatic, twisting or pivoting, event prior to which no symptoms were present. Some authors generalize the results of recent systematic reviews on arthroscopy in the setting of OA to all cases of meniscal pathology, which is not supported by available evidence. Patients who have a meniscal pathology in the setting of OA do benefit from arthroscopic partial meniscectomy. It is possible that patients with varying degrees of OA can develop a new meniscal tear, secondary to a repetitive injury or acute trauma, that is acutely painful or produces mechanical symptoms requiring surgical intervention. The key issue for the clinician is to ensure arthroscopy is being done for a meniscal pathology that is causing mechanical symptoms and pain.

It is important for a clinician not to overgeneralize and not to include patients with acute pathology in studies which tend to focus only on the chronic degenerative tears. For instance, RCTs by Kirkley et al,²⁰ Mosley et al,²¹ and Sihvonen et al,²² on which the above recommendations by Siemieniuk et al¹¹ are based, excluded patients with traumatic meniscal tears and those with locking symptoms.²¹ Additionally, many of the trials included in recent systematic reviews have had a significant number of patients crossing over from the conservative treatment groups to surgical interventions. For example, Herrlin et al¹² and Katz et al¹³ reported 27% and 30% crossover rates in their trials, respectively. This suggests that conservative management was not effective in resolving the symptoms in nearly one third of patients included in the studies. A possible explanation for this lack of response to conservative care would be that this subgroup consisted of patients with acute tears or another prognostic factor that requires further investigation. The findings reported by Katz et al²³ support this conclusion, as they evaluated the results from the MeTeOR (Meniscal Tear in Osteoarthritis Research) trial, in which arthroscopic partial meniscectomy with physical therapy was compared with physical therapy alone in 45-year-old patients with a concomitant

diagnosis of mild-to-moderate OA in the setting of degenerative meniscal tear. They found that patients with acute tears, which were more painful as characterized by increased pain scores and shorter duration of symptoms, were more likely to cross over to surgical intervention, as compared with those with less severe chronic tears. Thus, careful clinical investigation with a detailed history, physical examination (including special tests), and imaging studies is warranted in patients with arthritis complaining of acute pain, suspected to be due to a new, traumatic meniscal tear, to evaluate if an arthroscopic intervention will be beneficial.

Retrospective and prospective studies have documented improved outcomes in patients undergoing arthroscopic partial meniscectomy in cases of traumatic meniscal pathology.²⁴⁻²⁶ Even Siemieniuk et al,¹¹ who strongly dissuade arthroscopy in nearly all patients with OA, concede that they included only “those with sudden, but non-traumatic symptom onset.”¹¹ Hence, a role for arthroscopy in this subgroup of patients may still exist, but it requires clinical rigor of the surgeon to accurately diagnose these patients.

Once identified, the aim of an arthroscopic intervention in such cases is to resect torn and pathological meniscal tissue and debride meniscal surfaces back to a stable base. Meniscal tissue that is uninvolved and stable on examination is preserved, allowing for the retention of peripheral weight-bearing surfaces as much as possible.

While more common in younger patients, in rare cases, certain meniscal tears in this age group may be amenable to repair and would benefit from arthroscopic meniscal repair. A recent systematic review evaluated age-dependent outcomes of meniscal repair and identified no significant differences in failure of repair in patients both below or above the age of 40.²⁷ In selected patients with minimal osteoarthritic changes, such repair may be appropriate with the aid of arthroscopy.

Locked knee A locked knee refers to a clinical scenario in which a patient is unable to extend the knee completely. This is most commonly due to meniscal pathology—specifically a longitudinal tear of the meniscus known as a bucket-handle tear. When the teared fragment becomes displaced into the intercondylar notch, it can result in mechanical locking of the knee.²⁸ Such injuries often occur during sports with twisting or pivoting activities. Magnetic resonance imaging (MRI) is often used to confirm the diagnosis; however, the definitive treatment is an arthroscopic intervention to resect or repair the torn meniscal tissue.

A locked knee is arguably the most consistent indication for knee arthroscopy, even in the setting of significant OA when the cause is suspected to be due to a structural disruption in tissue. Unlike MRI, arthroscopy can provide both diagnostic and therapeutic benefits and, hence,

be potentially more cost-effective. In cases in which the wait times for MRI are long, early arthroscopic intervention can decrease morbidity and reduce pain. In nearly all reviewed studies evaluating the efficacy of arthroscopic knee surgery in the setting of arthritis, the presence of a locked knee was listed as an exclusion criterion.¹⁰⁻¹⁸ Presumably, this subgroup of patients was withheld from the studies because the consensus among the investigators was that this mechanical problem responds very well to arthroscopic intervention irrespective of the presence of OA. However, it is of utmost importance that prior to proceeding with the intervention, the clinician performs a rigorous examination of the patient to confirm a true mechanical block resulting in a locked knee, and not simply a pain inhibition response that hinders movement. Many patients, particularly those with OA, can present with knee pain which may hinder their knee range of motion and ultimately be misdiagnosed as a locked knee.¹ As suggested by Siemieniuk et al,¹¹ these patients with misdiagnosed locked knee may improve with conservative care, such as an exercise program.

Symptomatic loose bodies or synovial pathology

Loose bodies may be the result of trauma causing shearing injuries that may lead to osteochondral fragments or may be the result of conditions such as synovial chondromatosis. Loose bodies may result in catching, locking, or other mechanical symptoms in patients with a concomitant diagnosis of OA. Arthroscopic intervention allows for a minimally invasive treatment of patients with symptomatic loose bodies in the knee joint.²⁹ Reported outcomes are good to very good in retrospective literature evaluating the arthroscopic treatment of patients with synovial chondromatosis of the knee.³⁰

Synovial pathology requiring biopsy or resection can often be managed by arthroscopic means. Diffuse pigmented villonodular synovitis is a benign synovial proliferative disease which can involve the synovial lining of the knee. The condition most commonly occurs in the knee and can result in swelling, pain, and mechanical symptoms.³¹ While traditionally managed with open approaches, arthroscopic synovectomy is an alternative minimally invasive method by which this can be performed. In many cases, arthroscopic treatment of the patients with the condition allows for a more complete resection of diseased pathological tissue than open surgery.

A retrospective review by Gu et al³² suggested improved outcomes in patients undergoing arthroscopic intervention with respect to the International Knee Documentation Committee and Lysholm functional outcome scores ($P < 0.001$), as well as decreased surgical time, postoperative bleeding, and length of hospital stay ($P < 0.05$). Aurégan et al³³ performed a systematic review of 60 studies and found local recurrence rates

to be similar between open synovectomy and arthroscopic synovectomy (22.6% and 16.1%, respectively) and a lower rate of reported complications in arthroscopic synovectomy than in open synovectomy (0% and 19.3%, respectively). Arthroscopy, however, is not without limits, as some intra-articular locations are difficult to access with a scope and require open management. The clinician managing the pathology must be aware of the potential limitations and carefully review relevant imaging prior to proceeding with arthroscopy for such cases.

Known or suspected septic arthritis Septic arthritis most commonly affects the knee requiring urgent surgical intervention to decrease bacterial burden. The remaining untreated bacteria destroy chondral surfaces resulting in a joint-threatening condition. Surgical debridement, while often performed in an open manner, can be performed by arthroscopic means in a minimally invasive fashion. Johns et al³⁴ performed a comparative study evaluating outcomes in patients undergoing open or arthroscopic irrigation and debridement of septic knee arthritis in native joints. Arthroscopic intervention resulted in a decreased risk for repeat irrigation in comparison with the open procedures (50% vs 71%, respectively). Moreover, the patients reported improved range of motion after operation ($P = 0.016$), and a trend towards shorter hospital stay was observed ($P = 0.088$).³⁴

Surgical adjunct Arthroscopy may be an integral component or may be used as an adjunct or in combination with other surgical procedures. For example, arthroscopy plays an essential role in the reconstruction of cruciate ligaments of the knee in the setting of an isolated or multiligament knee injury.

In patients with OA primarily affecting one compartment of the knee (medial or lateral), knee realignment procedures, such as high tibial osteotomy, may be effective. Osteotomy allows for unloading of the diseased compartment allowing forces to cross the uninvolved joint surfaces. In a review by Brouwer et al,³⁵ 21 RCTs comparing osteotomy with other treatments for patients with unicompartmental OA were evaluated, and although the available evidence was of limited quality, such procedures were found to result in less pain and improved function. Arthroscopy plays an important role in high tibial osteotomy as it allows to confirm the presence of unicompartmental knee pathology prior to proceeding with realignment as well as to exclude or manage any other coexisting intra-articular joint pathology.

While the focus of this review is on patients with generalized OA of the knee with multicompartment involvement, earlier stages of the disease can have isolated cartilage damage that may be amenable to joint-preserving and cartilage-restoration procedures. The advances in this

field are growing at an exponential rate and are rooted in procedures such as microfracture or osteochondral allografts, but today are shifting increasingly towards biologic treatments and autologous chondrocyte implantation.^{36,37} While many of these treatments are still in their infancy and are typically reserved for younger patients with well-defined cartilage defects, as they continue to develop and the indications for their use broaden, it is not unreasonable to assume arthroscopy will play a role as a minimally invasive, site-specific delivery system for these treatments.

Diagnostic purposes Arthroscopy may play an important role as a diagnostic tool in cases in which the diagnosis is not clear with MRI or it is not possible to obtain an MRI scan in a timely manner. Additionally, when MRI is contraindicated based on patient characteristics, such as claustrophobia, obesity, or potential for metal artifact, arthroscopy provides an invaluable option for an intra-articular diagnosis.

Conclusions Arthroscopic debridement with or without partial meniscectomy has a limited role as a primary treatment for patients with osteoarthritic symptoms. Often, the procedure is unnecessarily performed in patients who may or may not have exhausted conservative treatment options. Patients on the continuum of OA, however, may benefit from arthroscopic intervention for a variety of other indications, as outlined in this review paper. Arthroscopy is a powerful surgical tool, which can provide surgeons with minimally invasive options to treat a variety of conditions. It is essential for the clinician to carefully select patients who will benefit from this modality to allow for treatment that is both effective and evidence-based.

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