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Review

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Osteoarthritis of the Knee: Is any Role for Arthroscopy in the Treatment? Current Review

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Abstract

There are few well controlled studies with long-term follow-up that establish selection criteria concerning arthroscopy in the osteoarthritic patients in the current literature. Nevertheless, the use of arthroscopy for the treatment of osteoarthritis of the knee has increased over the last decade. In the mean time, it is important to analyze the current literature in an effort to determine which patients are most likely to benefit from arthroscopy.

Keywords: Osteoarthritis; Knee; Treatment; Arthroscopy

Introduction

Degenerative arthritis is the most frequent disorder in elderly patients [1]. Knee osteoarthritis (OA) is more likely to result in disability than OA of any other joint [1].

The symptoms of OA of the knee are due to the effects of loose fragments of articular cartilage, debris, denuding of subchondral bone, degenerative tears of the menisci, loose bodies, osteophytes formation, synovitis, effusion, and limited motion caused by contractors, pain, and malalignment [2].

There are many treatment options available for the management of OA of the knee joint. Analgesics, physical and occupational therapy, arthroscopic joint debridement, joint lavage, and joint replacement have been all advocated as management techniques in the correctly selected patients [3].

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Arthroscopy has been used for the management of patients with OA with a varying degree of success, the varieties of techniques and the different methods of assessment that have been used to make a comparison of studies difficult. Nonetheless, In order to avoid an unnecessarily high failure rate from an indiscriminate use of arthroscopy in the OA patient, orthopaedic surgeon must attempt to identify accurately those subsets of patients who may benefit from such surgical procedure [4].

The purpose of this article is to review the literature on the role of arthroscopy in the management of OA of the knee providing background information on this topic including pathogenesis, diagnosis and the most recent studies.

Basic background

Hyaline cartilage provides the diarthrodial joint with a resilient, wear-resistant, low-friction surface with a high compressive stiffness, effectively minimizing peak loads of subchondral bone [5].

Type II collagen fibers, which are highly cross-linked by type IX collagen fibers, are predominantly responsible for the structure of hyaline cartilage. Water is the largest constituent of articular cartilage accounting for 70% to 80% of its total weight [5].

Negatively charged hydrophilic proteoglycans are composed of glycosaminoglycans attached to linear core proteins. The network of collagen fibrils and glycoamionglycans inhibits water to a limited degree. Chondrocytes are embedded within this "composite gel" and produce the surrounding matrix and procollagen as a precursor to collagen. Collagen provides the cartilage with its durability and tensile stiffness, while proteoglycans provide elasticity and resilience [5, 6].

Classification

Presently, there is no universal reliable accepted classification of OA. Nevertheless, the ideal description of OA should include the size, the profundity, the location, and the condition of opposing articular surface. Despite being initially developed for chondromalacia patellae, the Outerbridge

classification system is often used to classify the degree of degenerative arthritis. Grade 0 is normal articular cartilage. Grade l is associated with softening and swelling of the articular cartilage. Grade II has early fissuring less than 0.5 inches in maximum diameter and does not reach the subchondral bone. In grade III, the fissuring is greater than 0.5 inches in diameter and reaches the subchondral bone but is not exposed. Grade IV shows exposed subchondral bone of any size [5].

Evaluation

History

A comprehensive history is crucial in determining the appropriate treatment option. Pain localized to one component of the knee is common early in the disease. Whilst pain could be diffuse in long standing OA. Instability and pain may both be present in OA cases associated with ligamentous deficiency [5].

Physical examination

Range of motion is evaluated with side-to side- comparisons in the supine and prone positions. Patellofemoral or joint line crepitus is a common finding. Patellofemoral evaluation includes patellar tilt, lateral and medial patellar glide, patellar facet tenderness. The back, the ipsilateral hip and the ankle should be assessed for any abnormalities including decreased range of motion. The vascular status of the lower limb should be evaluated and documented [5].

Imaging Studies

Radiographs

A standing anteroposterior (AP) view is commonly obtained. Additionally, a 45-degree flexion weight bearing posteroanterior radiograph or non-weight-bearing true 45-degree flexion lateral view and a 45-degree axial Merchant view of both patellae could be helpful. The 45-degree flexion weight-bearing posteroanterior radiograph may show subtle loss of joint space which may not be seen in the traditional extension views [7, 8].

Weight-bearing radiographs that include both extremities from the hips to the ankles reveal any angular deformity accurately and determine the mechanical and anatomic axes of the limb [5].

Magnetic resonance imaging

Magnetic resonance (MR) imaging is the most useful in patients with minimal radiographic changes and with localized pain and clinical findings consistent with meniscal abnormality. Degenerative meniscal tears often coexist with OA. Proton density, fat-suppression, and gradient-echo techniques are useful in the evaluation of the articular cartilage [5, 9].

Technetium -99m bone scans

Technetium -99m bone scans are helpful in cases with normal plain radiographs despite having clinical manifestations of "arthritis like" symptoms. Abnormal bone scans are likely in the presence of symptomatic OA, meniscal tears, osteonecrosis and osteochondral lesions [5, 10].

Arthroscopic treatment of OA of the knee

Arthroscopic lavage alone washes out or dilutes the joint fluid, thereby decreasing the concentrations of degradative enzymes in the knee and consequently slowing the catabolism of proteoglycans and collagen [11]. Debridement procedures excise damaged portions of articular cartilage, synovial membrane or ligaments found within the joint. The removal of tissue debris during the debridement procedure improves symptoms by reducing the source of irritation of synovial tissue [12].

The efficacy of lavage procedure may correlate with the extent of the disease. In Livesley et al study [13], 37 osteoarthritic knees treated by arthroscopic lavage and physiotherapy were compared with a control group of 24 knees treated by physiotherapy alone. The lavage group showed more improvement in comparison with the control group. Besides, the patients with mild radiographic osteoarthritic changes experienced more pain relief than did those with severe changes. The physiotherapy group had some improvement in pain relief which was short term one. By the end of one year the patients returned to their pretreatment condition on the contrary to the lavage group.

Some studies have attempted to ascertain whether lavage or lavage combined with debridement offered better relief for the osteoarthritic knee. In a randomized study, Jackson et al [14] reported on 65 patients treated with lavage alone and 137 patients treated with lavage and debridement. In the lavage only group, 80% of patients showed initial improvement, this deteriorated to 45% at 3-year follow-up. Of the patients treated with lavage and debridement, 88% showed initial improvement; 68% maintained their improvement at 3-year follow-up.

On the contrary, Gibson et al [15] found that there have been some functional improvement after lavage but not after debridement and neither method significantly relieved symptoms. Additionally, the authors concluded that while lavage could offer some short-term benefit in moderate OA of the knee, debridement offered no benefits in such cases.

Patients with symptomatic OA of the knee are known to have an incidence of meniscal tears up to 91% on MRI [16]. Some authors have used terms such as "mechanically significant" to identify the subset of those tears that may cause symptoms and therefore benefit from the treatment [17]. Jackson and Rouse [18] reported 95% good to excellent results in patients who underwent arthroscopic partial meniscectomy in otherwise healthy knees. In patients with degenerative joint changes, arthroscopic partial meniscectomy produced 80 per cent good or excellent results in an average of two and half years follow-up.

Nevertheless, Chang et al [19] reported that patients with degenerative arthritis of the knee did not consistently gain relief after arthroscopic debridement. However, patients with tears of the anterior two-thirds of the medial meniscus or any lateral meniscus tear had a higher probability of improvement after arthroscopic surgery than did patients with other intraarticular pathology.

Bonamo et al [20] reported on 118 patients, aged 40 or older who underwent partial meniscectomy and limited debridement of coexisting grade III or grade IV degenerative articular cartilage lesions. No curettage, abrasion arthroplasty, or subchondral drilling was performed. At a mean follow-up of 3.3 years, 83% were satisfied. The authors concluded that arthroscopic partial meniscectomy and limited debridement was an acceptably effective procedure in patients over the age of 40.

Nonetheless, the definition of what constituted of simple degenerative fraying of meniscal tissue and what qualified as a mechanically significant tear is not consistently specified across the studies [17].

Loose bodies within the knee joint have been suggested by level V expert opinion as another factor predicting relief from Arthroscopy in patients with OA knee [21]. However there is no enough data about this topic in the literature. In Aaron et al [22] study, only nine of 122 patients had loose bodies, therefore, the authors were not able to determine a correlation due to lack of power. Likewise, Merchan et al [3] removed loose bodies in seven patients from total 35 patients. Moreover, they did not stratify results for these patients.

Arthrocopic treatment for the arthritic knee was advanced by Johnson [23] with his development of abrasion arthroplasty. He reported on a group of 95 patients with an average age of 60 years and with 2 years minimum follow-up. Seventy-four patients of this group improved subjectively.

Rand [24] compared arthroscopic partial menisectomy with limited debridement versus arthroscopic abrasion arthroplasty in patients with OA. Group I consisted of 131 patients treated by partial meniscectomy and debridement of loose articular cartilage. Group II consisted of 28 patients treated by debridement with abrasion arthroplasty of exposed bone. Fifty percent of Group II subsequently underwent a total knee arthroplasty for salvage at a mean of 3 years following the abrasion procedure. The author concluded that abrasion arthroplasty offer little benefit over partial meniscectomy and debridement in the degenerative knee. Moreover, results of abrasion arthroplasty are unpredictable.

Bert and Maschka [25] conducted a retrospective study, it was performed on 126 patients who had treatment with either abrasion arthroplasty plus arthroscopic debridement or arthroscopic debridement alone. Fifty-nine patients had abrasion arthroplasty and arthroscopic debridement, and 67 patients had arthroscopic debridement alone. All the knees were evaluated postoperatively at a minimum of 60 months. In the group treated with abrasion arthroplasty, 51% had well to excellent results, 16% had fair results, and 33% had poor results. In the group that had arthroscopic debridement, 66% had well to excellent results, 13% had fair results, and 21% had poor outcomes.

When performing arthroscopic debridement and/or meniscectomy, two vertically placed parapatellar tendon portals are useful. A supermedial or superolateral out-flow portal could be needed to accommodate pressure inflow and outflow from the pump. However this portal could potentially slow postoperative rehabilitation due to painful quadriceps muscle inhibition. This surgical procedure should be kept as simple as possible with the main goal being to remove unstable meniscal flaps. Prolonged surgical time should be avoided and surgery should be limited to only to the involved compartment [5].

Clinically, irrelevant osteophytes are not debrided as this may result in hemorrhagic effusion. Osteophytes are removed only if they may result in patellofemoral impingement with catching or extension loss, or involving intercondylar notch. Unstable meniscal tears are contoured to a stable rim leaving a maximum of normal tissue. Loose or unstable chontral flaps are removed to improve the transition between normal and abnormal cartilage. Over-zealous use of motorized instruments can damage both normal and abnormal cartilage surface. Articular lesions are better not to be curettage, abraded, or drilled unless a formal perioperative marrow-stimulating technique protocol is followed [5, 21].

Summary

Arthroscopic lavage involves the visually guided introduction of saline solution into the knee joint and the removal of the fluid. The term arthroscopic debridement may include the introduction of saline into the joint, in addition to articular trimming, lavage, meniscectomy, removal of osteophytes, and articular abrasion [1].

Currently, there is no sufficient evidence-based data to definitively recommend specific indications for the use of arthroscopy in the treatment of OA. Many of the prospective randomized studies in the literature lack stratification of arthritis severity, have poor enrollment and have a small

sample size. One reason for the persistence of arthroscopic treatment of knee OA, despite limited evidence, is the perceived relative minimal morbidity associated with the procedure and the desire of many patients to do whatever they can to gain relief while delaying or avoiding arthroplasty [4, 21].

Recently, according to Howell [26], there are three indications for treating OA knee with arthroscopy: 1), mild to severe OA with a complaint of mechanical symptoms from a loose body. For the loose body to be mobile and cause locking, it should reside anterior to the knee in the suprapatellar pouch on the radiograph. A posterior loose body typically is not mobile and does not cause locking because it is trapped inside the walls of a Baker's cyst; 2), arthroscopic removal of a meniscal tear when the presenting symptoms are mechanical with pain localized on the joint line in a knee with mild joint space narrowing (Kellegren-Lawrence grade 1). A meniscal tear is rarely the primary cause of pain in the knee with radiographic moderate to severe OA (Kellegren-lawrence grade 3 and 4); 3), arthroscopic excision of an anterior anvil osteophyte to improve extension in the knee with mild OA and a flexion contracture.

In doing arthroscopy for meniscal disease in knees with OA, Burks [27] has made the following conclusions: 1), when removing meniscal tissue, only mobile fragments should be removed; 2), patients with a short history of symptoms and specific trauma can be expected to have a good result; 3), bucket-handle tears are associated with better results; 4), the more significant the degenerative changes that are present, the poorer the results.

Generally, arthroscopic debridement should not performed in patients who have severe arthritis as defined by a joint space of less than 2 mm, fixed limb malalignment (>10 degrees), particularly valgus knees and bilateral disease [26].

Although Arthroscopy is valuable for the treatment of many knee disorders, expectations should be limited when this technology is applied to the arthritic knee. Therefore, patients should be counseled that the degree of arthritis is probably best assessed intraoperatively and the clinical outcome could depend on the severity of cartilage lesions that are seen during the arthroscopy procedure [12].

Disclosure

All authors have participated sufficiently in the intellectual content, the analysis of data. Each author has reviewed the final version of the manuscript and approves it for publication. No conflict of interest related to this article.

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