Acta Orthop. Belg., 2015, **81**, 1-8

REVIEW

Arthroscopy in knee osteoarthritis : a systematic review of the literature

Timothy Barlow, Christopher Downham, Damian Griffin

From Warwick Medical School, Coventry, UK

Knee arthroscopy has historically been a common treatment for knee osteoarthritis. A Cochrane review of the literature up to 2006 has resulted in guidance that arthroscopy is not effective in knee osteoarthritis. It cited that deficiencies in the evidence base prevented widespread acceptance of the recommendations. The aim of this review is to update the evidence base for the efficacy of arthroscopy in knee osteoarthritis.

The authors searched CINHAL, EMBASE, MEDLINE, and CENTRAL for randomised controlled trials that compared arthroscopic surgery in knee osteoarthritis with a control group (e.g. lavage, best medical care).

The primary outcome measure was patient reported functional outcome. The study methodology was registered on Prospero, a systematic review register ; Registration number CRD42012002891.

Five randomised controlled trials included 516 patients, almost double the 271 episodes contained in previous reviews. Two high quality studies, according to the Jadad classification, published since the Cochrane review, addressed many of the methodological flaws criticised in previous reviews. However, certain subgroup analyses (e.g. patients with meniscal tears and mechanical symptoms) are still underpowered.

Keywords : knee osteoarthritis ; arthroscopy.

INTRODUCTION

Knee osteoarthritis (OA) is a common condition, affecting more than 10% of the population over 60 years old (*2*). Knee arthroscopy has traditionally been a common tool in the treatment of knee OA. However a well publicised study by Moseley *et al* (*12*), combined with a Cochrane review of the literature up to 2006 (*10*), has resulted in NICE guidance recommending that arthroscopy should not be used in knee osteoarthritis. This guidance was based on "Gold" level evidence (*13*).

Subsequent to the publication of the Moseley et al paper, and the production of guidance, there has been a decrease in the volume of knee arthroscopies performed for knee osteoarthritis internationally. However, the data from such papers still suggests a significant number of arthroscopies are being performed for osteoarthritis (*15*). The reason for this is likely to be multifactorial, however a major factor is the widespread criticism of the Moseley et al paper, which resulted in poor acceptance of the results (*3, 11, 14, 17*).

■ Timothy Barlow, BSc (Hons), MBBCh (Hons), MRCS, Clinical Research Fellow.
■ Christopher Downham BSc (Hons), MBBS, MSc, MRCS, Clinical Research Fellow.
■ Damian Griffin, FRCS, Professor of Trauma and Orthopaedic Surgery.
Warwick Medical School, Coventry, UK.
Correspondence : Timothy Barlow, Clinical Sciences Research Laboratories, Warwick Medical School, University Hospital of Coventry and Warwickshire, Coventry, CV2 2DX. E-mail : timbarlow@doctors.org.uk

No benefits or funds were received in support of this study. The authors report no conflict of interests.

The aim of this review is therefore to perform a systematic review of the literature on the use and effectiveness of arthroscopy in treating knee osteoarthritis with or without meniscal degeneration. It will update previous reviews with any new literature since 2006, which has the potential to encourage more widespread acceptance of the evidence.

METHODS

Randomised controlled trials for Knee osteoarthritis and arthroscopic debridement of knee osteoarthritis that compared arthroscopic surgery with a control group (e.g. lavage, best medical care) were included. Only English language papers were included.

Inclusion : Adults with knee osteoarthritis with a follow up of at least three months.

Exclusion : Children (aged under 18 years).

Arthroscopic debridements of knee osteoarthritis studies were included. This excluded joint lavage, where the aim was soley lavage of the joint, and not any debridement of tissues. The control included non-surgical treatments that included, but was not limited to, physical therapy, steroid injections, synovial fluid substitute, joint lavage and sham surgery

Primary outcomes were applied as follows :

- Reduction of knee pain.
- Improvement of knee function (including Patient reported outcome measures)

There are multiple outcome measures that have been established in Knee OA including the Oxford Knee Score, the Lysholm Knee Scores, the International Knee Documentation Committee (IKDC) Scores, the Hospital for Special Surgery (HSS) Score, and the Western Ontario and McMaster Universities (WOMAC) OA Index. Also standardized measures of pain (e.g. the Visual Analogue Scale) were included. Different analgesic regimes were included in the data synthesis. Follow-up of at least three months was required.

The primary outcome measure of particular interest in this study was patient reported functional outcome.

Secondary outcomes included :

The time to next major intervention (e.g., Total Knee Replacement), indicating failure of the treatment or censoring due to end of the study or dropout.

The amount (doses, frequencies and types) of NSAIDs and/or analgesics used as rescue therapies in parallel with the treatment and control.

Search Strategy

CINHAL, EMBASE, MEDLINE, and CENTRAL databases were searched using the keywords “arthroscopy” and “knee”, or variations of them. Limitations to the English language and clinical trials was applied.

Data extraction, (selection and coding)

Titles and/or abstracts of studies were retrieved using the search strategy and those from additional sources were screened independently by two review authors (TB and CD) to identify studies that potentially met the inclusion criteria. The full text of these potentially eligible studies were retrieved and independently assessed for eligibility by two review team members. Any disagreement between them over the eligibility of particular studies was resolved through discussion with a third reviewer.

A standardised form was used to extract data from the included studies for assessment of study quality and evidence synthesis. Extracted information included : study population ; details of the intervention ; details of the comparator ; study methodology ; outcomes and times of measurement ; information for assessment of the risk of bias. Two review authors extracted the data independently.

Quality assessment

Quality assessment was performed using the Jadad system (*8*), which assessed methodological quality. Data extraction for quality assessment was likewise performed by two independent reviewers.

A protocol for the systematic review, including full search terms, was registered on Prospero, a systematic review register : Registration number CRD42012002891 (*1*).

RESULTS

The search returned 1603 papers. We identified 15 studies for full text review, of which five were included for the final analysis ; two more than were included in the Cochrane review. Of note, one study that examined different techniques of debridement was excluded because it had no comparator group for debridement (*18*). A study examining the

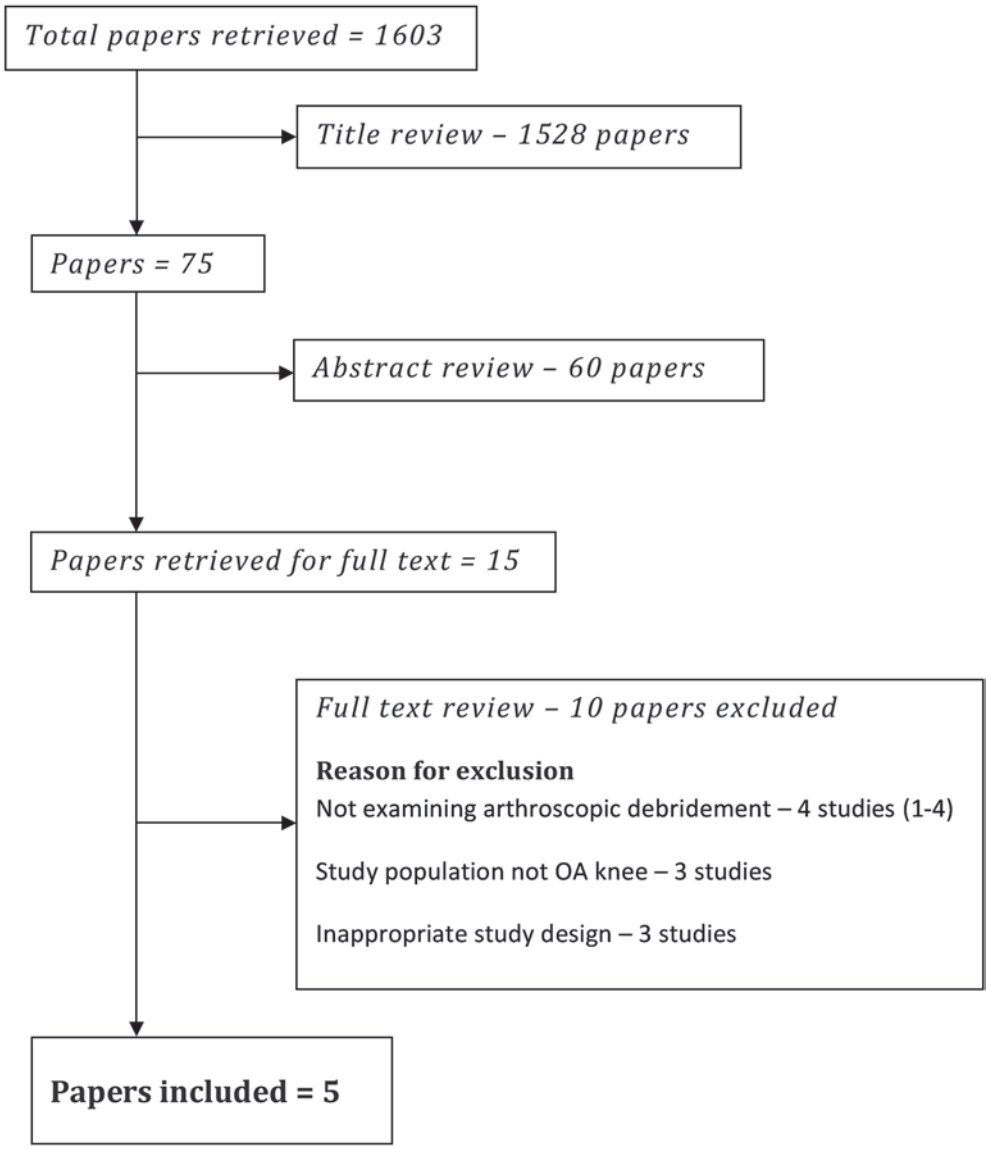

Fig. 1. — Flow diagram of included studies

treatment of degenerative meniscal tears was also excluded because not all patients in the study had osteoarthritis (*6*). A flow diagram of included studies can be found in Figure 1.

The basic demographics of the included studies can be found in Table I whilst Table II gives a summary of the results. Table III details the quality assessment of each paper. Each paper is discussed in turn below.

Forster *et al* (*5*)

The authors compare hyaluronic acid injection to arthroscopic lavage with or without debridement in 38 patients. Patients with symptomatic knee OA were included, but those with no joint space on weight bearing films, with mechanical symptoms, previous arthroscopic surgery, or any intra-articular injection in the last six months were excluded.

Table I. — Comparison of Study Characteristics

Author	Title	Interventions	Number of participants	Pt Lost to FU	FU length	Inclusion criteria	Exclusion criteria
Forster *et al* (*5*)	A prospective randomised trial comparing intra-articular Hyalgan injection and arthroscopic washout for knee osteoarthritis (OA)	Arthroscopic debridement ; hyalin injection (5 injections at 1-week intervals)	38	4	12 months	Patients on waiting list for arthroscopy with diagnosis of OA and some remaining joint space on WB radiograph	Allergic to avian protein, mechanical symptoms, previous arthroscopic surgery
Kirkley *et al* (*9*)	A randomized trial of arthroscopic surgery for osteoarthritis of the knee	Arthroscopic debridement ; best medical care	188	17	24 months	Adults with diagnosis of OA ; grade 2,3, or 4 OA (Kellgren–Lawrence)	Large meniscal tears ; inflammatory arthritis ; previous arthroscopy for OA ; more than 5 degrees of varus/valgus ; steroid injection in last three months ;
Moseley *et al* (*12*)	A controlled trial of arthroscopic surgery for osteoarthritis of the knee	Arthroscopic debridement ; lavage (plus debridement of large meniscal tears) ; palcebo	180	16	24 months	OA with moderate knee pain (measured on VAS) for at least 6 months	Arthroscopy on knee in last 2 years
Chang *et al* (*4*)	A randomized, controlled trial of arthroscopic surgery versus closed-needle joint lavage for patients with osteoarthritis of the knee	Athroscopic surgery (n=18) ; joint lavage (n=14)	34	2	12 months	OA with grade 1, 2, or 3 (Kellgren and Lawrence) ; pain longer than 3 months	Previous knee surgery within 6 months ; OA grade 4 ; TKR
Hubbard *et al* (*7*)	Articular debridement versus washout for degeneration of the medial femoral condyle. A five-year study	Arthroscopic debridement (40) ; Lavage (36)	76	8	5 years	Isolated degenerative lesion on the medial femoral condyle of grade 3 or 4 on the Outerbridge (1961) classification	Any other intrarticular pathology ; previous operation ; previous steroid injection ; loss of joint space on radiograph

This is a small study, with an unreported sampling strategy, and an unknown analysis method. Further issues include a lack of blinding, different baseline characteristics of groups, systematic exclusion of patients from the analysis, and a high chance of a type two error. Quality of the methodology score 3 on Jadad scale (Table I). No difference in outcome (pain (Visual analogue scale), function (Knee Society rating system), and the Lequesne index) was found between the groups.

Hubbard *et al* (*7*)

The author compares arthroscopic debridement with washout for patients who have isolated degenerative lesions of the medial femoral condyle. The 76 included patients all had pain for over one year, had an effusion, but maintained a full range of movement. Exclusion criteria included ligamentous damage and other degenerative lesions visible at arthroscopy.

Table II. — Comparison of Study Analysis and outcome measures

Author	Primary OC	Secondary OC	Analysis	Primary outcome measure result	Secondary outcome measures results	Comments
Forster *et al* (5)	n/a	Visual analoge scale ; KSS ; Lequesne index	Mann-Whitney	n/a	No difference in any outcome measure	Groups functionally different at baseline ; unreported sampling strategy ; systematic exclusion of patients from the analysis, and a high chance of a type two error.
Kirkley *et al* (9)	WOMAC at 24 months	MACTAR ; SF-36 ; ASES	Analysis of covariance	No difference	No difference	Multicentre study that excluded patients with severe osteoarthritis and large meniscal tears. Subgroup analysis of patients with mechanical symptoms demonstrated no difference in outcome.
Moseley *et al* (12)	Knee Specific Pain Scale	Arthritis Impact Measurement ; SF-36 ; Physical Functioning Scale	Haybittle–Peto	No difference	No difference	Non-validated outcome measure ; sample population predominantly veteran men. Use of sham surgery corrected for placebo response.
Chang *et al* (4)	n/a	Arthritis impact measurement scale ; assessor assessed swelling, pain to palpation, and knee motion (non-validated) ; economic analysis	ANOVA	n/a	No difference between groups at 3 months. At 12 months knee tenderness and physicians overall assessment was better in arthroscopy group.	Small study. Multiple comparisons made (27) with no correction therefore the two positive results likely not valid. Selection bias in that approximately half of eligible patients already had arthroscopy outside of study.
Hubbard *et al* (7)	n/a	Modified Lysholm score	Not reported	n/a	Arthroscopic debridement superior to lavage	Non-validated outcome measures ; no blinding of assessors. Patients had a single medial femoral condyle degenerative lesion – unable to represent the entire population of OA patients.

Key n/a = Not applicable.

This study's strength lies in its tight eligibility criteria, that provide a more experimental study design, and provide evidence towards the use of arthroscopy in this sub-population of patients. The results are not designed to, and should not, be extrapolated to the wider population of patients with OA of the knee. There are significant methodological flaws, mostly surrounding the outcome measures used, and the method of assessment. This is reflected in a score of 3 on the Jadad quality assessment criteria Table III).

The author found less pain in the debridement group at follow up.

Chang *et al* (4)

The authors compare arthroscopic surgery and closed needle joint lavage in 34 patients. Patients who were included had pain for over three months, had been treated with medical and rehabilitative treatment, and had arthritic changes on their knee

Table III. — Comparison of Study quality Assessments

Author	Was assignment of treatment described as random ?	Was method of randomisation well described & appropriate ?	Was the method really random ?	Was allocation concealed & concealment method described ?	Was study described as double blind ?	Who was blinded ?	Was method of blinding adequately described ?	Were withdrawals stated ?	SCORE on Jadad sale
Forster *et al* (5)	Yes	Yes	Yes	No	No	no-one	n/a	Yes	3
Kirkley *et al* (9)	Yes	Yes	Yes	Yes	No	assessors	Yes	Yes	4
Moseley *et al* (12)	Yes	Yes	Yes	Yes	No	patient and assessor	Yes	No	4
Chang *et al* (4)	Yes	No	Unknown	No	No	assessors	Yes	Yes	1
Hubbard *et al* (7)	Yes	Yes	Yes	No	No	n/a	n/a	Yes	3

radiograph. Patients were excluded if they had Kellgren class IV changes on the radiographs.

There are significant methodological flaws in this study, mainly surrounding the sample size, dropout rate, and degree of heterogeneity, which results in a Jadad score of 1 on the Jadad quality assessment criteria (Table III)

The authors found no difference between arthroscopic debridement and closed needle lavage.

Moseley *et al* (12)

The authors report a three armed, double blinded, randomised control trial comparing arthroscopic debridement, arthroscopic lavage, and placebo surgery in 180 patients with OA of the knee. The patients were recruited from one site, and one surgeon performed all the surgery. Patients who had ongoing pain (≥ 4 on the VAS) after six months of maximal therapy were included. Patients were also excluded if they had undergone an arthroscopy in the last two years, or if they had "severe" arthritis (defined as the sum of the Kellgren-Lawrence score for each knee compartment ≥ a). The authors found no difference in outcome (the Knee Specific Pain Scale, the Arthritis Impact Measurement Scale, SF-36) between debridement, lavage, and placebo.

This study demonstrates rigorous methodology, with a sham procedure to correct for the placebo response, adequate power and randomisation, blinding of assessors, patients, and nursing staff, and a thorough analysis. However, there are (much publicised) issues surrounding selection bias and the use of non-validated or non-specific outcome measures (*3,11,15,17*). Jadad score was 4 on the Jadad quality assessment criteria (Table III).

Overall it is a high quality study that provides strong evidence that arthroscopic debridement is no better than lavage or placebo.

Kirkley *et al* (9)

The authors present a randomised trial comparing arthroscopic debridement and conservative medical therapy. It is a single centre, multiple surgeon study, that includes 188 adult patients with osteoarthritis, excluding those with meniscal damage diagnosed preoperatively, those with very severe osteoarthritis (Kellgren-Lawrence grade IV in two compartments) in persons over 60 years, and various co-morbidities. They find no difference in outcome (the WOMAC and SF-36 score).

The authors present a methodologically robust trial using validated outcome measures, with a study sample that can be generalised to most practices. Furthermore, it addressed many of the criticisms of the Mosley *et al* paper. This study provides good evidence that there is no benefit of arthroscopic debridement in patients with OA knee. The Jaded

score was 4 on the Jadad quality assessment criteria (table III) ; however, the conclusion that patients with mechanical symptoms also do not benefit cannot be supported on the basis of the evidence presented, due to an insufficient sample size.

DISCUSSION

This review has included five randomised controlled trials examining the use of arthroscopy in knee osteoarthritis. None of the trials support the use of arthroscopy in patients with osteoarthritis, however one trial suggests arthroscopy is helpful in the subpopulation of patients that have isolated medial femoral condyle involvement. This is the lowest quality study, as indicated by the Jadad score, and it is open to debate if isolated medial femoral condyle degeneration constitutes osteoarthritis, or is a precursor for osteoarthritis (*16*).

This systematic review was subject to a number of limitations. Firstly, English language articles were specified in the inclusion criteria for full paper review, but not in the search strategy. This allows the possibility of missing data. However, in practice, no relevant studies in other languages were identified. Secondly, the studies included used different assessment scales, with many non-validated outcome measures. This has been cited in previous reports as one of the reasons the recommendations from such papers have not enjoyed widespread acceptance. No formal meta-analysis was performed. Previously meta-analyses have been performed, and have demonstrated no benefit of arthroscopy (*10*). The additional papers that we have included were consistent with this finding, and therefore further meta-analysis would not add significantly to our conclusions. What this review does add is the addition of studies that specifically answer some of the methodological flaws in previous papers making the results more valid, and therefore more representative.

Previous reviews of the literature have demonstrated that arthroscopy in knee osteoarthritis is of little, if any, benefit. The study by Mosley *et al* was well publicised, and led to high quality meta-analyses that subsequently recommended that arthroscopy should not be used in knee osteoarthritis. However, this recommendation has not enjoyed widespread acceptance (*14,17*), with the methodological flaws in the Mosley *et al* paper being reported as responsible (*3,11*). This has resulted in arthroscopy for knee OA still being used frequently, although the utilisation has decreased (*15*).

This review includes more studies, with one study by Kirkley *et al* addressing the major criticisms of the Mosley paper, namely the use of a validated outcome measure, and a more representative sample. As such, this strengthens the evidence base for not using arthroscopy in knee osteoarthritis patients.

The Hubbard *et al* paper demonstrated a benefit of arthroscopy in patients with isolated medial condyle cartilage defects. If this type of defect can be considered a subset of osteoarthritis, or is a separate entity that leads to osteoarthritis, is unclear (*16*). The patients included in this study did not have evidence of OA changes on their radiographs. Therefore the results of this study cannot be extrapolated to the wider group of patients with OA, but this subpopulation may represent a proportion of patients that can be treated arthroscopically.

Chang *et al* report that patients with certain meniscal tears had better outcome with arthroscopic surgery. The numbers used in this analysis, combined with various methodological flaws, make this conclusion difficult to accept. A larger trial, performed by Herrlin *et al*, examined degenerative meniscal tears treated with arthroscopy or a structured exercise regime, and demonstrated no difference between groups (*6*). However, the study included patients that did not have osteoarthritis, and therefore was not included in this systematic review. Consistent with this finding is the subgroup analysis from Kirkby *et al* of patients with mechanical symptoms, that demonstrated no difference in outcome between arthroscopy and conservative treatment. Unfortunately, the study was not powered to be able to perform this subgroup analysis, and it is unclear how many patients in the study by Herrlin *et al* had mechanical symptoms. Therefore, the current evidence does not support the use of arthroscopy in this subgroup of patients, however the evidence base is not as robust as for the entire population of OA knee sufferers.

CONCLUSION

The current evidence does not support the use of arthroscopy in knee osteoarthritis. Recent studies have improved the evidence base, and provide valid results that are more representative of most orthopaedic practices. The number of episodes studied in this review being 516 compared to 217 studied in the Cochrane review. This should allow more widespread acceptance of the results, with a consequent change in practice.

It is unclear if certain subgroups of patients with osteoarthritis would benefit from arthroscopy. The current evidence suggests that patients with an isolated medial femoral chondral lesion would benefit, however patients with mechanical symptoms and degenerative meniscal tears would not. The classification of patients with isolated medial femoral chondral lesions is open to debate, and this group may represent a population that do not yet have osteoarthritis, but are predisposed to its development.

This systematic review would support the current guidance that arthroscopy should not be used in knee osteoarthritis, with the exception of isolated medial femoral chondral lesions with normal plain radiographs. Additionally, there is no good evidence for the use of arthroscopy in patients with osteoarthritis who also have either mechanical symptoms or meniscal tears.

REFERENCES

1. **Barlow T, Downham C, and Griffin D.** Systematic review of arthroscopic surgery in knee osteoarthritis, Prospero, http://www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42012002891, 2012.
2. **Campbell MK, Skea ZC, Sutherland AG *et al.*** Effectiveness and cost-effectiveness of arthroscopic lavage in the treatment of osteoarthritis of the knee : a mixed methods study of the feasibility of conducting a surgical placebo-controlled trial (the KORAL study), in Health Technology Assessment, 2010, 1-115.
3. **Chambers K, Schulzer M, and Sobolev B.** A controlled trial of arthroscopic surgery for osteoarthritis of the knee, *Arthroscopy* 2002 ; 18 : 683-687.
4. **Chang RW, Falconer J, Stulberg SD *et al.*** A randomized, controlled trial of arthroscopic surgery versus closed-needle joint lavage for patients with osteoarthritis of the knee. *Arthritis Rheum* 1993 ; 36 : 289-296.
5. **Forster MC, and Straw R.** A prospective randomised trial comparing intra-articular Hyalgan injection and arthroscopic washout for knee osteoarthritis. *Knee* 2003 ; 10 : 291-293.
6. **Herrlin S, Hållander M, Wange P *et al.*** Arthroscopic or conservative treatment of degenerative medial meniscal tears : a prospective randomised trial. *Knee Surg Sports Traumatol Arthrosc* 2007, 393-401.
7. **Hubbard MJ.** Articular debridement versus washout for degeneration of the medial femoral condyle. A five-year study. *J Bone Joint Surg Br* 1996 ; 78 : 217-219.
8. **Jadad AR, Moore RA, Carroll D *et al.*** Assessing the quality of reports of randomized clinical trials : is blinding necessary ?. In : Control Clin Trials, United States, 1996, 1-12.
9. **Kirkley A, Birmingham TB, Litchfield RB *et al.*** A randomized trial of arthroscopic surgery for osteoarthritis of the knee. *N Engl J Med* 2008 ; 359 : 1097-1107.
10. **Laupattarakasem W, Laopaiboon M, Laupattarakasem P, Sumananont C.** Arthroscopic debridement for osteoarthritis of the knee. Chochrane Library, Cochrane Library of systematic reviews, 2009.
11. **Morse LJ.** Arthroscopic surgery for osteoarthritis of the knee. *N Engl J Med* 2002 ; 347 : 1717-1719.
12. **Moseley JB, O'Malley K, Petersen NJ *et al.*** A controlled trial of arthroscopic surgery for osteoarthritis of the knee. *N Engl J Med*, 2002, 81-88.
13. **NICE.** Arthroscopic knee washout, with or without debridement, for the treatment of osteoarthritis (IPG230), NICE, http://www.nice.org.uk/IPG230, 2007.
14. **Poehling GG.** Degenerative arthritis arthroscopy and research. *Arthroscopy* 2002 ; 18 : 683-687.
15. **Potts A, Harrast J, Harner C *et al.*** Practice patters for arthroscopy of osteoarthritis of the knee in the United States. *AM J Sports Med* 2012 ; 40 : 1247-1251.
16. **Rönn K, Reischl N, Gautier E, Jacobi M.** Current Surgical Treatment of Knee Osteoarthritis. *Arthritis* 2011, ID 454873.
17. **Siparsky P, Ryzewicz M, Peterson B, and Bartz R.** Arthroscopic treatment of osteoarthritis of the knee : are there any evidence-based indications ? *Clinical orthopaedics and related research* 2007 ; 455 : 107-112.
18. **Spahn G, Klinger HM, Mückley T, Hofmann GO.** Four-year results from a randomized controlled study of knee chondroplasty with concomitant medial meniscectomy : mechanical debridement versus radiofrequency chondroplasty. *Arthroscopy* 2010, S73-80.