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Review Article

Should We Still Perform Arthroscopy in Early Knee Osteoarthritis? A Retrospective Clinical Evaluation

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Keywords

• Knee; Arthroscopy; Early arthritis

Abstract

Objective: Arthroscopy as therapeutic procedure for knee osteoarthritis is a highly debatable issue. The aim of this retrospective clinical study was to evaluate the results of arthroscopy in elderly patients with early knee osteoarthritis, and to justify or reject the use of this minimal invasive technique before the decision of knee arthroplasty.

Design: All procedures were conducted by the senior author (I.K.T.) between 2012 and 2017. The study included 75 consecutive patients, older than 50 years, with early (Kellgren & Lawrence I,II) primary knee arthritis who fulfilled clinical and radiological criteria of the American College of Rheumatology and had no previous ligament injuries. All patients had failed to improve with conservative measures. Pre and post-operative Lysholm and Hospital for Special Surgery (HSS) knee scores were assessed and patients were reviewed at 2 years. Intraoperatively, arthroscopic evaluation of cartilage lesions was based on the International Cartilage Regeneration and Joint Preservation Society (ICRS) scoring system.

Results: The HSS score was significantly improved at 2 years postoperatively (p=0.048) in patients with symptomatic meniscal lesions. However, in patients operated for cartilage lesions no significant improvement was shown but there was a tendency to improve especially in higher grade lesions. The Lysholm score showed no-statistically significant changes in all patients.

Conclusions: Careful selection of patient subgroups, especially those with symptomatic meniscal tears or focal higher grade cartilage lesions could lead to successful mid-term clinical outcomes. In such patients, postponing or even canceling joint replacement could be a good clinical practice.

INTRODUCTION

The most common cause of osteoarthritis (OA) of the knee is age. Almost everyone will eventually develop some degree of osteoarthritis [1,2]. Whether they eventually receive a joint arthroplasty, it depends on the severity of the disease and the patient's expectations and motivations. The pain associated with OA has a tremendous impact on the quality of life of the affected individuals and their family environment, thereby comprising a major social issue that needs to be properly addressed. Prompt diagnosis and intervention is essential in order to alleviate pain and improve the quality of life. Several factors are known to affect the increasing prevalence of the disease, including the ongoing increase in both life expectancy and obesity rates, which are tightly connected to the pathogenesis of OA [1,3]. Nevertheless, despite the extensive study of the various factors that lead or aggravate the symptoms of OA, the exact pathophysiological background remains obscure and lies upon the interplay of external factors and multiple molecular pathways [4].

Several grading and classification systems have been developed over the years to assist decision making regarding the treatment options. One of the most commonly used systems, in the setting of clinical studies, is the criteria of the American College of Rheumatology (ACR), which includes clinical symptoms, radiological findings and laboratory tests (Table 1) [5]. Radiological classification of knee OA can be assessed by weight-bearing X-rays based on the Kellgren-Lawrence (K&L) score and MRI scanning with the WORMS score (Table 2) [6,7]. Currently, there is an increasing interest in identifying early OA in order to employ treatment options based on the field of regenerative medicine that could delay its progression. Towards this direction, several attempts have been made to define early OA [8,9], As proposed by Luyten et al., early OA could be defined by the combination of knee pain, K&L grade 0-II and either arthroscopic or MRI findings of cartilage lesions [8].

Similarly to other diseases that lack specific etiology, management of knee OA is highly variable and includes both conservative and surgical measures. Patient education and lifestyle modifications, especially weight loss and physical

Table 1: Classification criteria for knee idiopathic osteoarthritis (OA) according to the American College of Rheumatology used for the patients' selection (5).

	Clinical & Laboratory	Clinical & Radiographic	Clinical	Clinical
Knee pain	+	+	+	+
AND	At least 5 of 9:	At least 1 of 4:	At least 3 of 6:	At least 4 of 6:
Age	>50	>50	>50	>50
Stiffness	<30min	<30min	<30min	<30min
Crepitus	+	+	+	+
Bony tenderness	+		+	+
Bony enlargement	+	osteophytes	+	+
Palpable warmth	_		_	_
ESR	<40mm/hr			
Rheumatoid Factor	<1:40			
Serum Fluid	Clear, viscous or WBC<2.000/mm^3			
Sensitivity	**92%**	**91%**	**95%**	**84%**
Specificity	**75%**	**86%**	**61%**	**89%**

* ESR = Erythrocyte Sedimentation Rate (Westergren), WBC = White Blood Cell count.

Table 2: The Kellgren & Lawrence radiological classification for idiopathic knee OA used for the patients' selection (6).

Grade	Radiologic findings
0	No radiological findings of OA
I	Doubtful narrowing of joint space and possible osteophytic lipping
II	Definitive osteophytes and possible narrowing of joint space
III	Moderate multiple osteophytes, definite narrowing of joint space, small pseudo- cystic areas with sclerotic walls and possible deformity of bone contour
IV	Large osteophytes and marked narrowing of joint space, severe sclerosis and definite deformity of bone contour

therapy are recommended in early stages of knee OA [10]. Pharmacological treatment, mainly using non-steroidal anti-inflammatory drugs (NSAIDs) is also warranted in symptomatic patients. However, the mainstay of treatment remains surgical intervention with total knee arthroplasty [11]. The role of arthroscopy in primary degenerative knee OA remains a highly debatable issue, with the majority of current literature to point against its routine use [12]. However, in carefully selected cases, such as patients with medial meniscal tears, there is evidence of clinical benefit [13].

The purpose of the present study is to present the results regarding the usefulness of knee arthroscopy in early stage osteoarthritis. In an effort to measure an entity such unmeasurable and subjective as the quality of life, several scoring systems have been developed over the years. The Lysholm knee score has been proved reliable in reporting the functional evaluation of treatment of both anterior cruciate ligament injuries and meniscal tears from the perspective of the patient [14,15]. The Hospital for Special Surgery (HSS) knee score has also been used in order to assess the functional outcome of knee osteoarthritis as well as total knee arthroplasty [16,17]. The above tools, designed to assess knee-specific conditions, are used in the present study to evaluate the clinical outcomes of knee arthroscopy.

PATIENTS AND METHODS

The present retrospective study included the records of 75 consecutive patients that, during the period of 2012-2017, were treated with knee arthroscopy for early stage symptomatic osteoarthritis. Ethical approval was taken from Institute's Ethical Committee. All patients were older than 50 years, with primary knee early OA (K&L stages I and II), fulfilled clinical, radiographic and laboratory criteria of the ACR and had no traumatic ligamentous injuries. All patients had failed to improve with conservative measures for a pre-operative period of 3 to 6 months (NSAIDs, hyaluronic acid intra-articular injections, glucosamine/chondroitin supplements intake, physical therapy, exercise, body weight loss). As baseline, (a) AP weight bearing & Lateral x-ray views at 30 degrees knee flexion were evaluated according to Kellgren-Lawrence score (K&L), (b) MRI was performed routinely in all patients in order to identify intra-articular pathology, (c) patient-reported functional evaluation was measured with both Lysholm and HSS knee scores and (d) arthroscopic evaluation of articular lesions was performed with the use of International Cartilage Regeneration and Joint Preservation Society (ICRS) score [18]. Patients (a) less than 50 years of age, (b) with secondary osteoarthritis (including post-traumatic and rheumatoid arthritis), (c) uncertain diagnosis and (d) K&L score III-IV, were excluded from the study.

All procedures were performed by one surgeon (I.K.T) under spinal or general anaesthesia. Patients were positioned supine

with a thigh tourniquet applied routinely. A single-dose of 2nd generation cephalosporin was administered. Arthroscopy was performed through two standard portals (Antero-Medial and Antero-Lateral). Cartilage lesions were evaluated and classified according to the ICRS classification. Then, menisci and cruciate ligaments were evaluated. Finally, any other intra-articular lesion or finding (loose bodies, osteophytes, synovial plicas, and fat pad syndrome) was recorded. According to the findings, partial meniscectomy, cartilage shaving or microfracture, loose bodies or osteophytes removal, and hypertrophied plicas or fat pad resection were performed (Figure 1). Postoperatively, a single dose of hyaluronic acid injection was performed in selected patients with cartilage lesions. No cortisone or local anaesthetic intra-articular injections were performed.

Partial medial or lateral meniscectomy was performed in 71 patients (lateral n=7, medial n=57, both n=8). Hyaluronic acid injections were performed totally in 10 patients. Subchondral drills were performed at the medial femoral condyle (MFC) in two patients due to subchondral oedema. Microfracture was performed at the MFC only in four patients, at the MFC and trochlea in one patient, at trochlea and patella in one patient, at trochlea only in two patients, at the lateral femoral condyle (LFC) in one patient. Mosaicplasty (a single osteochondral cylinder of 6mm diameter) was performed in a MFC focal osteochondral lesion in only one patient.

All patients were discharged the same day. Pain killers and NSAID's but no thromboprophylaxis was prescribed. Post-operatively, early mobilization with the use of crutches for three days was applied to all patients. No special knee braces were used except the patient that mosaicplasty was performed. Patients followed a simple and comprehensive physiotherapy protocol for three weeks. No special protocol for the microfracture patients was recommended. The patients were routinely follow-up at 3, 6, 12 and 24 months postoperatively. However, Lysholm and HSS scores were evaluated at 24 months and compared with pre-operative measurements.

For data analysis: (1) preoperative and postoperative HSS and Lysholm scores were evaluated for different lesion sites (medial and lateral meniscus as well as medial and lateral femoral condyle, medial and lateral tibial condyle, trochlea and patella

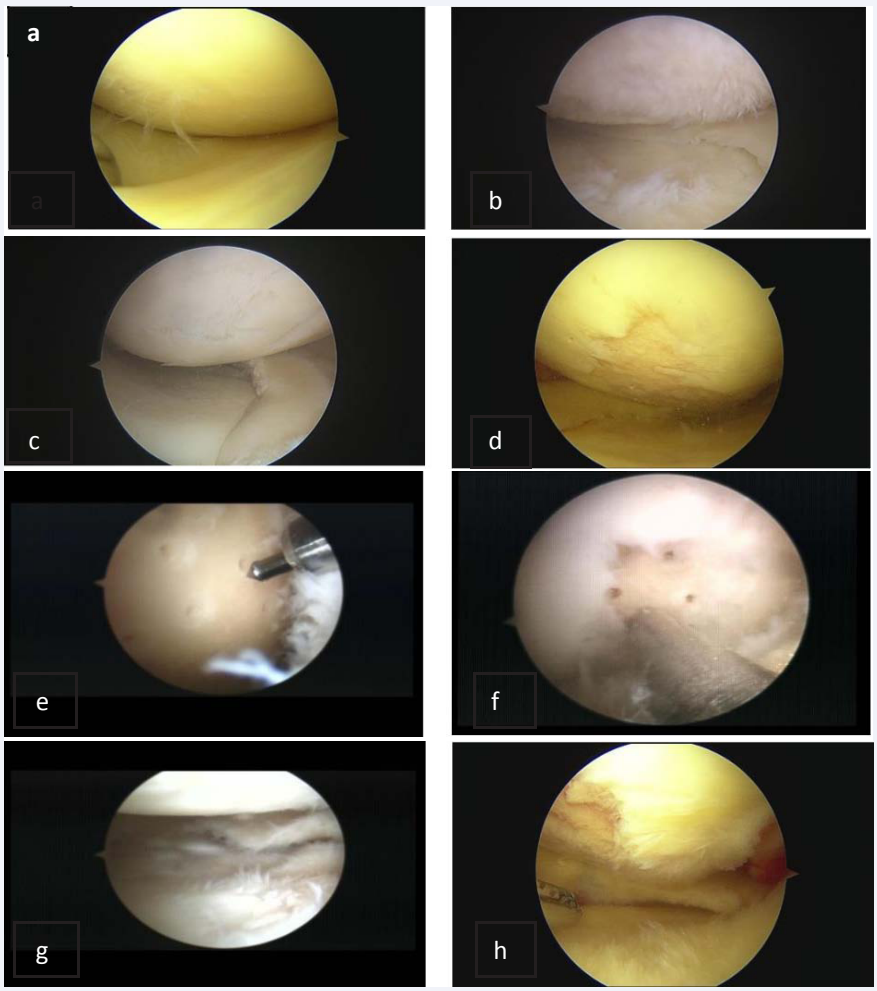

Figure 1 Grade I lesion (a), grade II lesion (b), grade III lesion (c), grade IV lesion (d), according to the ICRS classification. Microfracture technique (e,f), degenerated meniscal lesion (g), combined cartilage and meniscal lesion (h).

cartilage lesions), (2) patients were classified into three groups according to cartilage lesion severity as normal (ICRS grade 0), mild (ICRS grade I-II) and severe (ICRS grade III-IV), and (3) patients were subdivided as above and below 60 years of age.

Statistical analysis

Data were expressed as mean ± standard deviation (S.D.) or mean ± standard error (S.E.) (for two-way ANOVA models) for continuous variables and as percentages for categorical data.

Two-way ANOVA model was used to examine the interaction between the 'evaluation' factor and 'gender', 'age' factors respectively. The comparison of variables preoperatively was performed using the One Way model. Pairwise comparisons performed using the Bonferroni test. Comparison of percentage change from preoperative to postoperative evaluation of parameters between categories of different sites was analyzed using the One Way ANOVA model. Pairwise comparisons performed using the Bonferroni test. Kruskal-Wallis test and Mann-Whitney test were used in case of violation of normality. All tests are two-sided, statistical significance was set at $p < 0.05$. All analyses were carried out using the statistical package SPSS vr 21.00 (IBM Corporation, Somers, NY, USA).

RESULTS

The sample of the present study consisted of 35 males and 41 females with a mean age of 62 years (50.84). Arthroscopic surgery was performed in 40 right knees and 36 left knees. A medial meniscal tear was the most common finding (66%), while 9% of the patients were found to have an affected lateral meniscus. Cartilage defects were classified according to the ICRS score [19] and patients were categorized into three groups following the ICRS score: normal (ICRS grade 0), mild (ICRS grade I-II), and severe (ICRS grade III-IV) (Table 3).

Pre- and post-operative Lysholm and HSS knee scores were evaluated for every different lesion site of the knee. Age and gender had no effect in the percentage change of either score. The severity categories of lesion sites were homogeneous regarding the preoperative HSS and Lysholm scores. However, the HSS score of the trochlea lesion in group III-IV was significantly lower compared to group 0 (p=0.009) and group I-II (p=0.007) respectively (Table 4).

The percentage change from pre to post-operative HSS knee score was not statistically significant between cartilage groups for all lesion sites. However, the percentage change of lateral meniscus was significantly higher (p=0.033) compared to no meniscal lesion. When cartilage groups were compared regardless of the lesion site for HSS score, severe group (ICRS grade III-IV) presented marginally significant improvement compared to normal/mild groups (ICRS grade 0-II)(p=0.063). Regarding the percentage change from pre- to post-operative Lysholm score, there were no statistically significant difference between cartilage groups at any site and regardless of the lesion site (Table 5).

Two-way ANOVA model using as factors the ''age'' (less than 60y vs more than 60y) and ''Evaluation'' (normal/mild cartilage lesion vs severe cartilage lesion) revealed a significant difference between normal/mild lesion vs severe lesion group (p=0.046) independent of age regarding the HSS knee score but not for the Lysholm score (Table 6).

Two-way ANOVA model using as factors the ''gender'' (male vs female) and ''Evaluation'' (normal/mild cartilage lesion vs severe cartilage lesion) revealed statistically significant difference between normal/mild lesion vs severe lesion group

Table 3: Demographic data and arthroscopic findings of the involved patients.

		N	%
Gender	Male	35	46,1
	Female	41	53,9
Affected site	Right knee	40	52,6
	Left knee	36	47,4
Affected meniscus (degenerated or acute tear)	None	13	17,1
	Medial	50	65,8
	Lateral	7	9,2
	Both	6	7,9
Medial femoral condyle cartilage lesions (ICRS score)	0	14	18,4
	I-II	30	39,5
	III-IV	32	42,1
Lateral femoral condyle cartilage lesions (ICRS score)	0	53	69,7
	I-II	17	22,4
	III-IV	6	7,9
Patellofemoral cartilage lesions (ICRS score)	0	44	57,9
	I-II	12	15,8
	III-IV	20	26,3
Medial tibial condyle cartilage lesions (ICRS score)	0	57	75,0
	I-II	12	15,8
	III-IV	7	9,2
Lateral tibial condyle cartilage lesions (ICRS score)	0	66	86,8
	I-IV	10	13,2

Table 4: Comparison of HSS and Lysholm scores between lesion sites preoperatively.

Site		N	HSS score		Lysholm score	
			Mean (±SD)	**p-value**	**Mean (±SD)**	**p-value**
Meniscus	None	13	55,00(±8,42)	0.244	52,15(±12,81)	0.236
	Medial	50	57,00(±6,55)		57,52(±10,36)	
	Lateral	7	49,29(±12,39)		61,71(±6,42)	
Medial Femoral Condyle	0	14	51,79(±11,20)	0.162	55,43(±7,43)	0.100
	I-II ICRS	30	56,50(±6,97)		60,13(±8,57)	
	III-IV	32	56,09(±7,04)		54,63(±12,67)	
Lateral Femoral Condyle	0	53	55,57(±7,76)	0.920	56,04(±11,46)	0.362
	I-II	17	55,59(±5,56)		60,18(±8,13)	
	III-IV	6	54,17(±15,30)		55,83(±6,71)	
Trochlea	0	44	56,70*(±5,39)	***0.003***	57,55(±12,19)	0.508
	I-II	12	59,17*(±4,69)		58,58(±9,23)	
	III-IV	20	50,50(±11,69)		54,65(±6,71)	
Medial Tibial Condyle	0	57	54,82(±7,90)	0.304	57,05(±9,89)	0.300
	I-II	12	58,75(±4,33)		59,50(±9,29)	
	III-IV	7	55,00(±12,58)		51,71(±16,49)	
Lateral Tibial Condyle	0	66	55,455(±7,8313)	0.987	57,09(±10,899)	0.763
	I-IV	10	55,500(±9,5598)		56,00(±8,179)	
Patella	0	63	54,68(±7,67)	0.135	56,62(±10,93)	0.728
	I-II	7	60,71(±6,07)		60,00(±9,17)	
	III-IV	6	57,50(±11,73)		56,83(±8,33)	

*p<0.05 vs III-IV

Table 5: Comparison of percentage change (%) from preoperative to postoperative evaluation (at 24 months) of HHS and Lysholm scores regarding gender, age and lesion site.

		N	**HSS score**		**Lysholm score**	
			Mean % (±SD)	**p-value**	**Mean % (±SD)**	**p-value**
Gender	Male	35	60,32(±18,53)	0.352	54,87(±21,64)	0.247
	Female	41	56,38(±18,05)		48,36(±26,27)	
Age	<60	32	59,75(±19,14)	0.531	51,02(±24,56)	0.917
	>60	44	57,07(±17,73)		51,61(±24,41)	
Meniscus	None	13	49,86(±22,89)	***0.048***	50,45(±27,90)	0.163
	Medial	50	57,98(±16,62)		54,54(±23,57)	
	Lateral	7	73,58*(±16,31)		47,51(±19,13)	
Medial Femoral Condyle	0	14	59,11(±20,11)	0.979	54,49(±27,38)	0.141
	I-II	30	57,92(±19,78)		44,58(±23,74)	
	III-IV	32	58,04(±16,44)		56,35(±22,68)	
Lateral Femoral Condyle	0	53	59,42(±18,51)	0.187	53,88(±23,92)	0.163
	I-II	17	51,73(±16,49)		41,56(±23,78)	
	III-IV	6	65,63(±18,48)		56,87(±25,99)	
Trochlea	0	44	54,83(±14,12)	0.200	48,20(±24,11)	0.383
	I-II	12	59,16(±21,17)		53,35(±29,14)	
	III-IV	20	65,03(±23,00)		57,12(±21,59)	

Medial Tibial Condyle	0	57	59,62(±18,78)	0.452	52,83(±23,93)	0.600
	I-II	12	52,39(±15,08)		45,02(±26,91)	
	III-IV	7	56,54(±19,17)		50,23(±24,78)	
Lateral Tibial Condyle	0	66	58,55(±18,75)	0.667	52,19(±23,63)	0.449
	I-IV	10	55,86(±15,120)		45,89(±29,25)	
Patella	0	63	57,71(±18,69)	0.590	49,85(±24,28)	0.466
	I-II	7	56,29(±13,14)		56,50(±22,64)	
	III-IV	6	65,48(±19,73)		61,26(±27,52)	
Overall evaluation	0-I-II	34	53,87(±16,85)	***0.063***	46,56(±27,40)	0.123
	III-IV	42	61,70(±18,79)		55,24(±21,04)	
*p=0,033 vs None						

Table 6: Two-way ANOVA model for age and evaluation factors of the % change from pre- to post- operative HSS and Lysholm scores.

	Age < 60	**Age > 60**	**p-value** $_{Age}$	**Independent of Age**
	mean±SD(%)	**mean±SD(%)**		**mean±SE(%)**
HSS score				
Normal/Mild lesions	53.00±13.96	54.55±19.18	0,794	53.78±3.11
Sever lesions	65.70±21.42	58.97±16.68	0,260	62.33±2.83
p-value $_{Evaluation}$	*0,060*	0,419		***0,046***
	mean±SE(%)	mean±SE(%)		Interaction $_{Evaluation\text{-}Age}$
Independent of Evaluation	59.35±3.19	56.76±2.74	0.541	0.328
Lysholm score				
Normal/Mild lesions	45.07±28.94	47.74±26.87	0,782	46.41±4.21
Severe lesions	56.26±19.34	54.55±22.49	0,799	55.41±3.83
p-value $_{Evaluation}$	0,203	0,366		0,118
	mean±SE(%)	mean±SE(%)		Interaction $_{Evaluation\text{-}Age}$
Independent of Evaluation	50.67±4.32	51.15±3.71	0.933	p=0.701
* Normal/mild lesions = ICRS 0-II and Severe lesions= ICRS III-IV				

Table 7: Two-way ANOVA model for gender and evaluation factors of the % change from pre- to post- operative HSS and Lysholm scores.

	Male	**Female**	**p-value** $_{Gender}$	**Independent of Gender**
	mean±SD(%)	**mean±SD(%)**		**mean±SE(%)**
HSS score				
Normal/Mild lesions	56.54±17.10	52.22±16.90	0,476	54.38±3.20
Severe lesions	62.55±19.37	60.75±18.59	0,761	61.65±2.80
p-value Evaluation	0,361	0,132		0,091
	mean±SE(%)	mean±SE(%)		Interaction Evaluation-Gender
Independent of Evaluation	59.55±3.17	56.48±2.83	0.474	0.768
Lysholm score				
Normal/Mild lesion	45.14±20.71	47.44±31.29	0,816	46.29±4.24
Sever lesion	60.62±20.50	49.33±20.51	0,082	54.97±3.71
p-value Evaluation	***0,039***	0,822		0,128
	mean±SE(%)	mean±SE(%)		Interaction Evaluation-Gender
Independent of Evaluation	52.88±4.20	48.39±3.75	0.428	0.231
* Normal/mild lesion= ICRS 0-II and Severe lesion= ICRS III-IV				

(p=0.039) for males regarding the Lysholm score but not for the HSS knee score (Table 7).

DISCUSSION

The results of this retrospectively conducted clinical study indicated that knee arthroscopy has still a place in the treatment of early stage knee OA, especially when meniscal tears are involved. Those tears may be acute or degenerative; however they produce symptoms of pain, locking or instability. Widespread awareness regarding knee OA leads to early diagnosis in relatively younger individuals, making the quest for less invasive treatment options imperative. When conservative measures alone fail to provide clinical improvement, and mechanical symptoms co-exist, knee arthroscopy could provide a useful bridge until TKA is warranted, as was recently supported in a retrospective analysis of 1215 arthroscopic procedures by Camus et al [20].

The results of early studies such as the controlled study performed by Kalunian et al. in 2000 and Moseley et al. in 2002 put the usefulness of knee arthroscopy in knee OA into question, despite its widespread use at that time [21,22]. Since then, multiple case-control studies and systematic reviews have failed to prove superiority of the technique compared to placebo [23,24]. The practice guideline recommendations of the American Academy of Orthopaedic Surgeons (AAOS), based on those studies, is against the use of knee arthroscopy in primary knee OA [25].

On the other hand, practice guidelines of AAOS are inconclusive regarding the use of arthroscopy when meniscal tears are present [25]. The results of our study are in line with those of Saurabh Giri et al., and Figueroa et al. which support the notion that when meniscal injuries or unstable cartilage lesions co-exist with mild or moderate OA, knee arthroscopy can provide symptomatic relief in a follow-up of about 18 and 36 months respectively [26,27]. It is important to note that in the study of Figueroa et al., the authors found no difference in clinical outcome of patients older than 70 years old, highlighting the fact that other factors than just the OA stage are of great importance. Patient's age, body weight, physical activity and axial deformities (mechanical or anatomical) should also be borne in mind when considering knee arthroscopy as a treatment option. The meticulous selection of patient population that could possibly benefit from knee arthroscopy is paramount in order to achieve a successful long-term clinical outcome. A review article by Lamplot et al. also supports the use of arthroscopy for mild OA and symptomatic meniscal tears [28]. However, careful selection of patients is important as there is a tendency to over-treat degenerative meniscal tears as noted by Azam et al., [29]. Therefore, exhausting all conservative measures before proceeding to arthroscopy is vital. Evidence also exists that knee arthroscopy could be useful in cases where there is isolated mild cartilage lesion of the MFC according to Hubbard et al. and reviewed more recently by Camus et al., [20,30].

The results of the present study also suggest that the severity of cartilage lesion can influence the functional outcome. More severe lesions (ICRS grades III - IV) tend to ameliorate the clinical outcomes, improving the HSS score, than milder lesions (ICRS grades I-II). The percentage change for the HSS score, regardless the lesion site, was close to significance (*p=0.063*) with 62% change in severe and 54% change in mild lesions. This outcome might conclude that knee arthroscopy could be beneficial even in more severe cases of OA, as was also indicated by Giri et al., [27].

Limitations

This study has retrospectively collected data and no control group. However, it would be unethical to continue offering conservative treatment to patients suffering of chronic osteoarthritic symptoms. Additionally, the study involves heterogeneous procedures such as meniscectomy and cartilage regeneration techniques, but authors considered all of them as part of the arthroscopy. Therefore, it is arthroscopy which was evaluated as surgical intervention. Finally, based on the inclusion criteria, the study was limited to patients with early OA (K&L I-II) and one could say that the results were not terribly surprising. However, the debate whether to perform arthroscopy or joint replacement is applied basically on patients with early knee osteoarthritis and not on patients with severe progression of the disease.

CONCLUSION

Conclusively, despite the lack of consensus on the role of arthroscopy for early knee OA, our results indicated that careful selection of candidates, especially those with degenerative meniscal tears and/or focal cartilage lesions that produce painful or mechanical symptoms, could lead to successful mid-term clinical outcomes, postponing or even cancelling the scenario of early joint replacement. Additionally, patients "not ready for metal", with mild but persistent osteoarthritic symptoms, may benefit from such a simple, safe, minimally invasive and low cost procedure that would keep them functional and happy for a few or many more years.

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