Cumhuriyet MedicalJournal, 45(3): 112-124, 2023
DOI: http://dx.doi.org/10.7197/cmj.1282215

Cumhuriyet Medical Journal

| cmj.cumhuriyet.edu.tr | Founded: 2004 Available online, ISSN:1305-0028 Publisher: Sivas Cumhuriyet Üniversitesi

A Comparison of the duration of knee survival in patients with primary knee osteoarthritis who have treated viscosupplementation or arthroscopic debridement.

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Research Article

History

Received: 13/04/2023
Accepted: 15/09/2023

ABSTRACT

To determine whether intraarticular viscosupplementation and arthroscopic debridement can delay knee arthroplasty.

142 patients who had VAS and OX-12 records from the first visit and regular control visit and who belonged to the control group who were referred to our clinic with pain and limitation of movement in the knee diagnosed with primary osteoarthritis of the knee Grade 2-3 according to the Kellgren-Lawrence Classification (KLC) and were followed up for at least 5 years (6,7 ±1,4 years) were included in the study. Of the 142 patients, 87 (61,3 %) were female and 55 (38,3%) were male. The average age of the patients was 53,2 ± 14,3. The groups were compared for average age on first admission, gender, the existance of morbid obesity and diabetes, average Visual Pain Score (VPS), and Oxford-12 Questionary (OX-12) scores, and smoking. Time between the first admission and arthroplasty was also compared.

Arthroplasty was performed in 87 (61,3%) of the 142 patients in 6,7±1,4. In the control group, which consisted of patients taking only NSAIDs, patients who were given viscosupplementation and patients who underwent arthroscopic debridement, the rate of total knee arthroplasty was 61,5%, 60,4%, and 61,9%, respectively.

We determined that despite an improvement in clinical symptoms like pain between the sixth month and the second year, viscosupplementation and arthroscopic debridement do not ameliorate the degenerative process and radiologic deterioration and do not affect on the duration until total knee arthroplasty.

Keywords: Knee osteoarthritis, treatment, viscosupplementation, arthroscopic knee debridement, microfracture, drilling

Viskosuplemantasyon veya Artroskopik Debridman Tedavisi Gören Primer Diz Osteoartritli Hastalarda Dizin Hayatta Kalma Süresinin Karşılaştırılması

Süreç

Geliş: 13/04/2023
Kabul: 15/09/2023

ÖZ

Eklem içi viskosuplementasyon ve artroskopik debridmanın diz artroplastisini geciktirip geciktiremeyeceğini belirlemek.

Kliniğimize dizde ağrı ve hareket kısıtlılığı nedeniyle başvuran ve primer osteoartrit tanısı alan, ilk muayene ve düzenli kontrolden itibaren VAS ve OX-12 kayıtları bulunan ve kontrol grubunda yer alan 142 hasta. Kellgren-Lawrence Sınıflamasına (KLC) göre Grade 2-3 olan ve en az 5 yıldır (6,7±1,4 yıl) takip edilen diz hastaları çalışmaya dahil edildi. 142 hastanın 87'si (%61,3) kadın, 55'i (%38,3) erkekti. Hastaların yaş ortalaması 53,2±14,3 idi. Gruplar ortalama ilk başvuru yaşı, cinsiyet, morbid obezite ve diyabet varlığı, ortalama Görsel Ağrı Skoru (VPS), Oxford-12 Anketi (OX-12) skorları ve sigara kullanımı açısından karşılaştırıldı. İlk başvuru ile artroplasti arasındaki süre de karşılaştırıldı.

142 hastanın 87'sine (%61,3) 6,7±1,4 artroplasti uygulandı. Yalnızca NSAİİ alan hastalar, viskosuplementasyon verilen hastalar ve artroskopik debridman uygulanan hastalardan oluşan kontrol grubunda total diz artroplastisi oranı sırasıyla %61,5, %60,4 ve %61,9 idi.

Altıncı ay ile ikinci yıl arasında ağrı gibi klinik semptomlarda iyileşme olmasına rağmen, viskosuplementasyon ve artroskopik debridmanın dejeneratif süreci ve radyolojik bozulmayı iyileştirmediğini ve total diz artroplastisine kadar geçen süreyi etkilemediğini belirledik.

Anahtar sözcükler: Diz osteoartriti, ted, viskosuplementasyon, artroskopik diz debridmanı. mikro kırılma, sondaj

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*How to Cite:*Karagüven D, Benli İT (2023) A Comparison of the duration of knee survival in patients with primary knee osteoarthritis who have treated viscosupplementation or arthroscopic debridement, Cumhuriyet MedicalJournal, September 2023, 45(3): 112-124

Introduction

Degenerative arthritis most frequently affects the knee, along with the hip and spine. Gonarthrosis is the progressive degenerative arthritis of the knee that causes pain and limitation of joint movement, degeneration in the joint space, and alignment disorders and is mostly varus. The incidence of knee osteoarthritis after the sixth decade of life is reported to be more than 75% [1]. Although total knee arthroplasty is accepted as the gold standard treatment for end-stage osteoarthritis, an increased incidence of complications is reported especially with advanced age and comorbidity. Conservative treatments, invasive procedures, or minor surgical interventions are necessary to avoid or delay surgery in younger ages or earlier stages, alleviate the symptoms and for patients who do not want to undergo surgery [2].

Conservative treatment options in degenerative arthritis of the knee are nonsteroid anti-inflammatory drugs (NSAID) [3], corticosteroids, physiotherapy modalities, and intraarticular viscosupplementation [4,5], while arthroscopic debridement, high tibial osteotomy, and unicompartmental or total knee arthroplasty are surgical treatment options [6,7].

As in most diseases, conservative modalities usually precede surgery. There are numerous studies evaluating the efficacy of nonsteroid NSAIDs in the literature [8]. Similarly, there are a number of studies concerning the efficacy of viscosupplementation, which has been an option for a few decades, and its comparison to NSAIDs [9,10,5]. In recent years, high density human hyaluronic acid equivalents and their combinations with Chondroitin-S are reported to increase treatment efficacy and positive results have been obtained in 60-80% of the cases [5].

In patients with knee osteoarthritis, the period between the onset of the degenerative process and total knee arthroplasty, which is a period where the patients' cartilaginous tissue is sufficient, can be termed as the survival of the knee. There are a number of studies reporting extended knee survival periods as a result of arthroscopic debridement where intraarticular cartilage pieces and meniscal debris are extracted and the concentration of destructive enzymes causing intraarticular carthilage destruction decreased. Also damaged regions are freshened via chondroplasty and microfracture techniques [11]. However, to the best of our knowledge, no study evaluates the effect of NSAIDs, viscosupplementation, and arthroscopic debridement on the period before total knee arthroplasty is deemed necessary.

Therefore, the primary end-point of this study was to investigate whether arthroscopic debridement and intraarticular viscosupplementation are effective in the treatment of degenerative arthritis of the knee and if not, whether they can delay knee arthroplasty.

Patients and Method

This study (Project no: KA20/220) was approved by Clinical Research Institutional Review Board (Approval number: 94603339-604.01.02/17473) and informed consent forms were taken from all patients. This retrospective cohort study is based on hospital records.

One hundred and ninety patients who visited our clinic with pain and limitation of movement in the knee between October 29th, 2009 and December 31st, 2015, diagnosed with primary osteoarthritis of the knee Grade 2-3 according to the Kellgren-Lawrence Classification (KLC) and were followed up for at least 5 years (6,7 ±1,4 years) were included in the study. Exclusion criteria were secondary osteoarthritis due to traumatic intraarticular fracture or dislocation, septic arthritis, cartilage destruction caused by metabolic, congenital or rheumatic causes, meniscectomy, and patients who were Grade 1 (no narrowing of the joint space or cartilage degeneration) according to the KLC classification and were given palliative treatment in addition to the patients who had Grade 4 degenerative arthritis and subsequently underwent TKA. After excluding 38 patients who did not show up for their last control visit, 142 patients including the control group were included in data analysis. All patients included in the study had normal physiologic alignments in the lower extremities.

The primary hypothesis (H_0) of the study was "Intraarticular viscosupplementation using only hyaline-20 and arthroscopic joint cartilage debridement prolongs the duration until knee arthroplasty". The control group consisted of patients who did not receive any invasive interventions and were given only combined nonsteroid anti-inflammatory drugs.

Every patient referring to the orthopedics and traumatology clinic of our hospital with complaints of pain and limitation of movement in the knee is routinely questioned for the duration of the pain and (visual analog scale) VAS scores at the onset and

first admission. The standard orthopedic examination evaluates the range of motion and flexion contractures, varus or valgus angles if present. Additionally, the Oxford Functional Score (OX-12), which has been validated and gained widespread use for measuring functional capacity, is applied to all patients**.** Predisposing factors for primary knee osteoarthritis such as age, sex, morbid obesity, diabetes, and smoking are also questioned at the first visit. The patients enrolled in this study were asked to visit at the 3rd and 6th months and once every 6 months after that. In the follow-up visits physical examination was carried out, Rosenberg standing x-rays were taken, VAS and OX-12 scores were calculated and recorded.

Of the 142 patients, 87 (61.3 %) were female and 55 (38.7%) were male. The average age of the patients was 53.2 ± 14.3 (55 – 74). The patients were followed up for a minimum 5 and maximum of 8 years (6,7±1,4 years) (Table 1)

The patients were divided into three groups; Group-1. Patients who underwent arthroscopic joint cartilage debridement and microfracture (n:42; 29,6%); Group-2. Patients who were given intraarticular viscosupplementation once a month, at least three times (n:48; 33,8); Group-3. Patients who were given only NSAIDs (n:52; 36,6%)

Table-1. Distribution of the mean age, sex, obesity, diabetes, smoking, mean VAS and OX-12 scores of the patients at the first visit.

	Control	Viscosupplementation	Arthroscopic debridement	Total	F	p
Number of patients	52	48	42	142		
Age	52,4 ± 15,3	51,4 ± 16,3	55,6 ± 14,8	53,2 ± 14,3	0,885	0,415
Female/Male	33/19 (1,48)	29/19 (1,53)	25/17 (1,47)	87/55 (1,58)	0,174	0,980
Obesity+/-	34/18 (1,89)	31/17 (1,82)	27/15 (1,80)	92/50 (1,84)	0,014	0,987
Diabetes+/-	29/23 (1,26)	27/21(1,29)	23/19 (1,21)	79/63 (1,25)	0,021	0,990
Smoking+/-	23/29 (0,79)	22/26 (0,85)	19/23 (0,83)	64/78 (0,82)	0,027	0,990
Mean VAS scores at first visit	5,0 ± 2,5	5,5 ± 2,4	5,1 ± 2,0	5,3 ± 2,2	0,619	0,540
Mean OX-12 scores at first visit	22,4 ± 5,7	24,5 ± 5,9	23,7 ± 5,7	23,5 ± 5,8	1,658	0,194

Viscosupplementation

The indication for viscosupplementation was the existence of pain restricting daily activities, the existence of KLC grade 2-3 degeneration in the patellofemoral, and femorotibial joint restricting movement, and the existance of changes which did not cause instability of intraarticular structures in magnetic resonance imaging. 20,000 Daltons Hyaline-L was injected intraarticularly following sterile draping. Viscosupplementation was applied for a minimum 3 and maximum 4 times every 6 months (Figure-1).

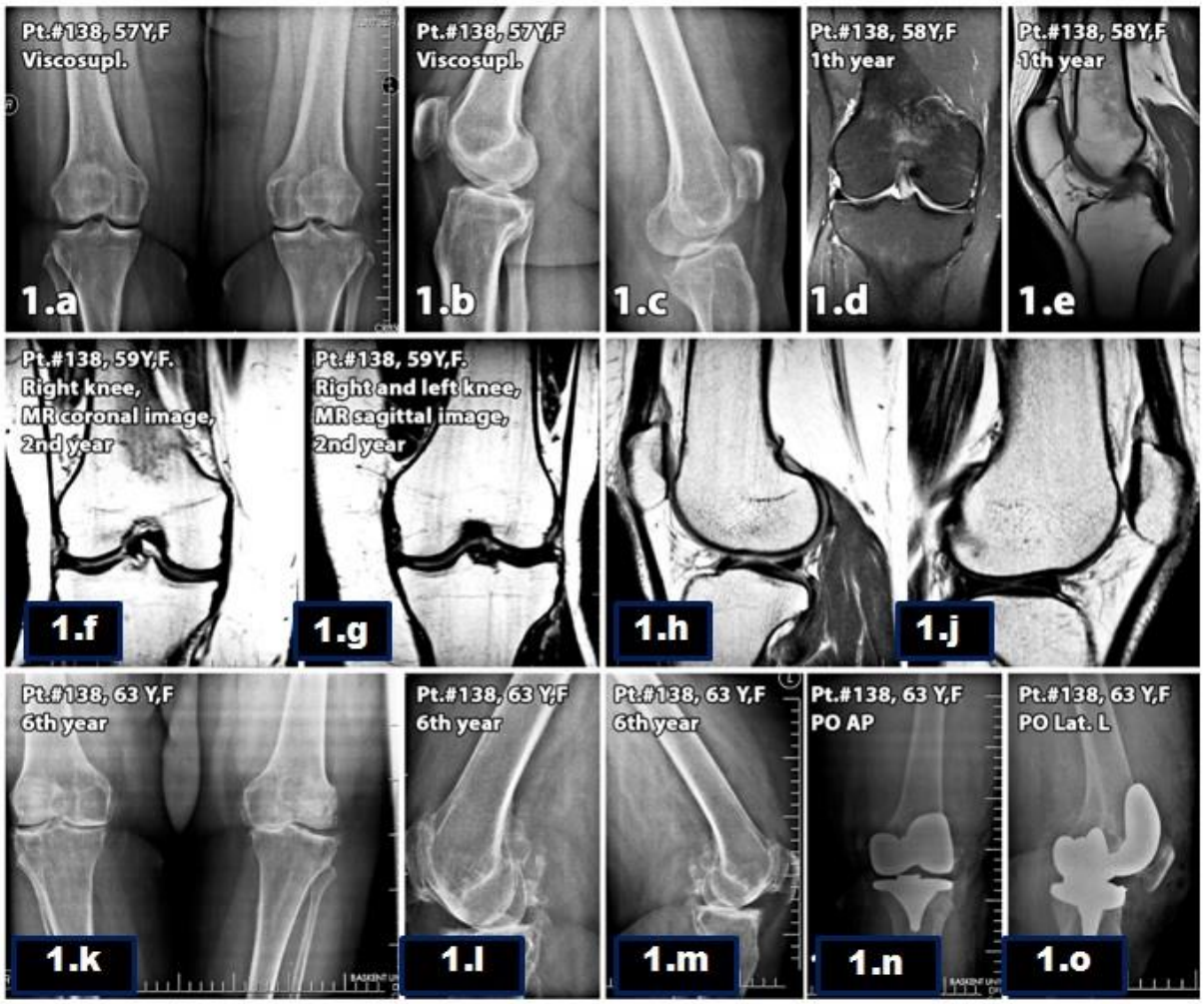

Figure-1. Pt.#138, This 57 years-old woman had Kellgren-Lawrence Classification (KLC) grade-2 degeneration at first admission. (a) AP x-ray of the knee prior to viscosupplementation three times every 6 months with Hyalen-L, (b-c) lateral x-rays of both knees, (d-j) Coronal and sagittal MR scans of both knees at 1st and 2nd years, (k-m) standing AP and lateral x-rays of both knees, (n-o) AP and lateral x-rays following total knee arthroplasty at 6th years.

Articular cartilage debridement

The indication for arthroscopic joint cartilage debridement was defined as the existence of pain that restricts daily activities, existance of knee instability with KLC grade 2-3 degeneration, osteochondral defects in the patellofemoral and femorotibial joints and existence of degenerative tears in intraarticular structures, especially in the menisci, as reported in magnetic resonance imaging.

The patients were positioned supinely under spinal anesthesia and a tourniquet was applied to the proximal femur. The joint was accessed via two standard portals and was evaluated arthroscopically. During the procedure, synovial tissues, meniscal residues, and free osteophyte bodies were removed and osteochondral lesions were shaved using a shaver and reformed using radiofrequency. Osteochondral lesions were restored using the microfracture technique. This technique was applied if an osteochondral lesion was bigger than 2 cm and cartilage surface was entirely shed. The procedure was ended after the release of the tourniquet. The patients were told not to bear weight on the operated leg for 6 months if the microfracture technique was employed (Figure-2 and 3).

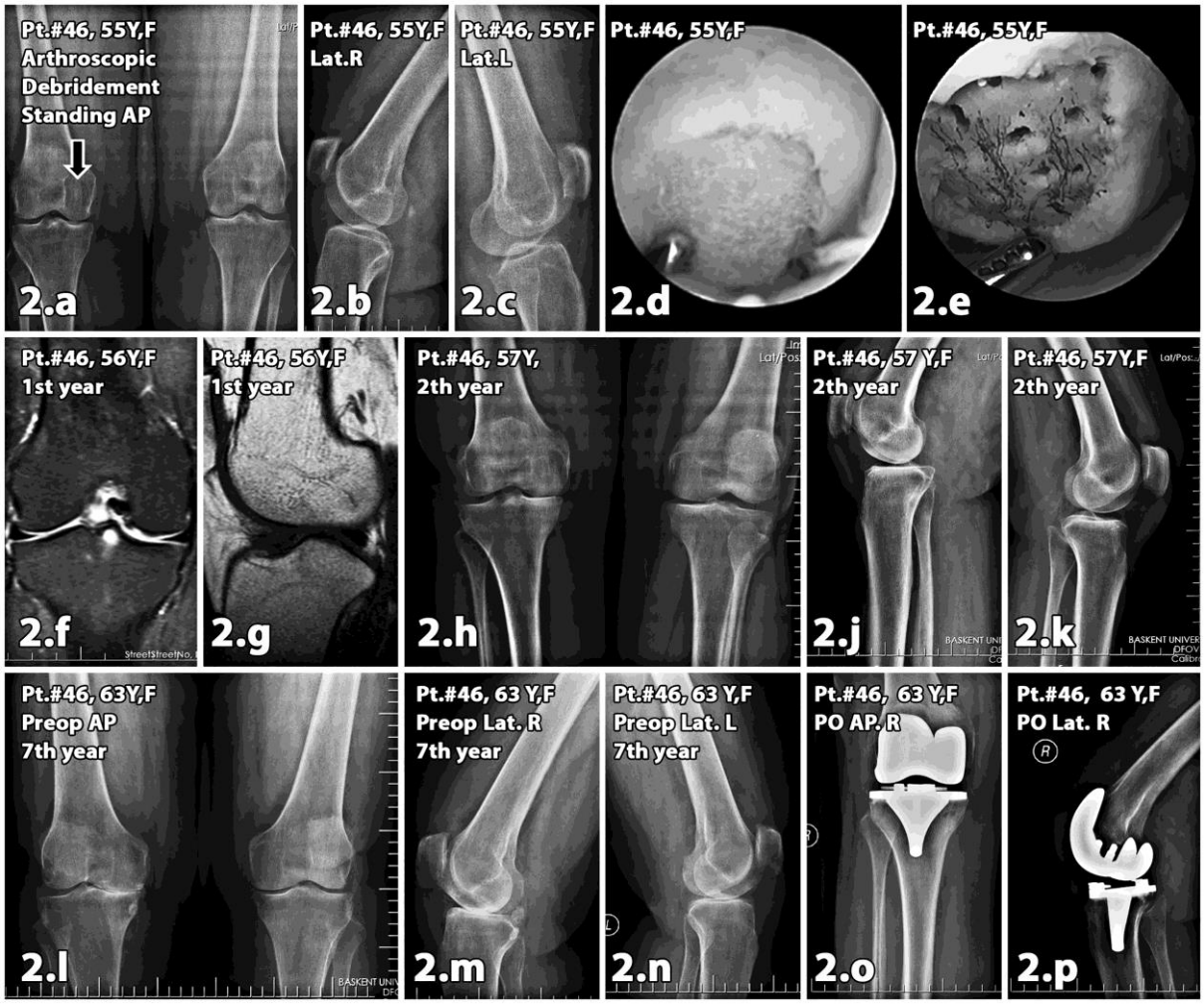

Figure-2. Pt.#46, This 55 years-old woman had Kellgren-Lawrence Classification (KLC) grade-2 degeneration at first admission. **(a)** Arrow is pointing the cartilage defect on the femoral condyl in preoperative Rosenberg AP x-rays of both knees prior to arthroscopic debridement, **(b,c)** lateral x-rays of both knees, **(d)** recordings image during arthroscopy after arthroscopic debridement of the cartilage defect, **(e)** the image after arthroskopic micro-fracture technique, **(f-h)** Coronal and sagittal MR scans of the right knee at 1st year**, (j-l)** Standing AP and lateral x-rays of both knees at 3rd year, (m,n) Standing AP and lateral X-rays of both knees at 7th year, **(o,p)** AP and lateral x-rays following total knee arthroplasty at 7th year.

Study Design

The primary endpoint of this study was to investigate whether arthroscopic debridement and intraarticular viscosupplementation are effective in the treatment of degenerative arthritis of the knee and if not, whether they can delay knee arthroplasty.

The patients were divided into three groups;
Group-1. Patients with Arthroscopic debridement and microfractures (n:42; 29,6%),

Group-2. Patients with Intraarticular Viscosupplementation administered monthly for 4 months (n:48; 33,8)
Group-3. Patients with only NSAIDs administered (Control group) (n:52; 36,6%)

The primary endpoint of this study was to investigate whether arthroscopic debridement and intraarticular viscosupplementation are effective in the treatment of degenerative arthritis of the knee and if not, whether they can delay knee arthroplasty.

In both 3 groups of 142 patients, predisposing factors for Osteoarthritis in first examination was compared. No statistically difference were found in VAS and OX-12 scores for male/female ratio, obesity, diabetes, smoking habits and KLC classification (p>0,05) (Table-1). The intergroup distribution of data when epidemiological, predisposing factors and VAS and OX-12 scores of all patients were considered was similar to the intergroup distribution (p>0,05) (Table-1).

Figure-3. Pt.#98, This 59 years-old man had Kellgren-Lawrence Classification (KLC) grade-2 degeneration at first admission. **(a)** Standing Rosenberg AP x-rays of both knees prior to arthroscopic debridement, **(b,c)** lateral x-rays of both knees **(d)** image of cartilage degeneration on medial femoral condyl recording during arthroscopy, **(e)** debridement of degenerative cartilage with the radio-frequency during arthroscopy, **(f-h)** Standing AP and lateral x-rays of both knees at 1st year, **(j,k)** AP and lateral views of both knees at EOS graphies at 3rd year, **(l,m)** Standing AP and lateral x-rays of the left knee at 8th year, **(n,o)** AP and lateral x-rays following total knee arthroplasty at 8th year.

There was no statistically significant difference concerning the distribution of patients with Grade 2 and 3 degeneration based on the KLC used for radiological evaluation among groups (Table-2)

The control group consisted of patients who did not undergo any procedures until the last control. The VAS and OX-12 scores of viscosupplementation and arthroscopic debridement groıups were recorded starting at 6 months after the procedure, once a year.

The last controls were performed between October 1st, 2022- January 1st, 2023. At the last control, radiological results in addition to the history of total knee arthroplasty, if carried out, and the period between the first and the last visit was recorded.

For the patients who underwent knee arthroplasty, the VAS and OX-12 scores before the operation were recorded while for those who did not undergo surgery, the VAS and OX-12 scores at the last visit were recorded.

In this study; 87 (61,3%) of the 142 patients underwent knee arthroplasty. The distribution of these 87 patients among groups were statistically evaluated. Number of patients who did not undergo knee arthroplasty (knee survival) at the last control and their distribution among groups. The time between the first visit and the knee arthroplasty. The groups were statistically compared for the average time between these two-time points. The average VAS and OX-12 scores of the patients at the first visit, at biannual control visits, and the last

control were determined. For the patients who had undergone knee arthroplasty before the last control, the OX-12 and VAS scores before the operation were used.

Variables tested:

1- Of 142 patients in this study, 87 (% 61.3) patients underwent knee arthroplasty and statistically evaluated (Table-3).

2- Duration between first examination and if applied, time of knee arthroplasty application and statistical analysis (Table-4).

3- All groups statistical comparison in terms of OX-12 and VAS scores at 6th month follow ups.

Statistical Analysis

The SPSS 25.0 program was used in the statistical analyses, variance analysis test (F), Pearson Correlation Test (r), Ki-Square Test (X^2) were also used. The value of probability was set as p: 0.05.

Table.2. Distrubation of the patients according to the Kellgren-Lawrence Classification (KLC) at the first visit.

	KLC Grade-2	KLC Grade-3	Total (%)
Control	22/52 (0,423)	30/52 (0,577)	52 (36,7 %)
Viscosupplementation	20/48 (0,417)	28/48 (0,588)	48 (33,8 %)
Arthroscopic debridement	18/42 (0,429)	24/42 (0,541)	42 (29,5 %)
Total	59/142 (0,416)	83/142 (0,585)	142 (100 %)
X^2	0.028		
p	0.986		

Table-3. Distrubation of the number and rate of the patients with or without TKA according to treatment groups at the last control visit.

	Number and ratio of the patients who underwent TKA	Number and ration of the patients who did not undergo TKA	X^2	*p*
Control 52 (36,7 %)	**32 / 52 (61,5 %)**	**20 / 52 (38,5 %)**	**0.017**	**0.991**
Viscosupplementation48 (33,8 %)	**29 / 48 (60,4 %)**	**19 / 48 (39,6 %)**		
Arthroscopic debridement 42 (29,5 %)	**26 / 42 (61,9 %)**	**16 / 42 (38,1 %)**		
Total 142 (100 %)	**87 / 142 (61,3 %)**	**55 / 142 (38,7 %)**		

Table-4. Distrubation of the number and rate of the patients who were opereted with TKA and mean time untill TKA operation since first admitance (years) according to treatment groups.

	Number and ratio of patients who underwent TKA	Average time until TKA (years)
Control 52 (36,7 %)	**32 / 52 (61,5 %)**	**5,9 ± 1,9**
Viscosupplementation48 (33,8 %)	**29 / 48 (60,4 %)**	**6,4 ± 2,4**
Arthroscopic debridement 42 (29,5 %)	**26 / 42 (61,9 %)**	**6,0 ± 2,1**
Total 142 (100 %)	**87 / 142 (61,3 %)**	**6,1 ± 2,2**
F	**0.017**	**0.745**
p	**0.991**	**0.476**

Results

Variables such as average age, male/female ratio, morbid obesity, smoking, existance of diabetes, and VAS scores at the first visit were compared and no statistically significant difference was found (p>0,05) (Table-1).

This result shows that groups were statistically similar at the first visit for comorbidities and demographic variables such as age and sex. To better assess the effectiveness of viscosupplementation and arthroscopic debridement, we aimed to investigate obesity and diabetes across groups, which are reported as factors that speed up the degenerative process in the literature and did not find a significant difference concerning these two diseases (p>0,05) (Table-1). There was no statistically significant difference between groups concerning the ratio of KLC grade 2/grade 3 patients when the degeneration and loss of joint space based on K-L classification was evaluated (p>0,05) (Table -2).

An average of 6,7±1,4 years (5-8 years) of retrospective records were evaluated. 87 (61,3%) of the patients had undergone total knee. The rate of operation due to total knee arthroplasty indication in the control group which consisted of patients who were given NSAID only, viscosupplementation groups, and the arthroscopic debridement group was 61,5%, 60,4% and 61,9% respectively. There was no difference between these groups concerning the ratio of patients who underwent total knee arthroplasty (p>0,05) (Table-3).

The patients who underwent total knee arthroplasty and were Grade 2 and 3 at the first visit had radiological findings of increased degeneration and had become Grade 4 at the last control. Their VAS scores were greater than 8 and the OX-12 scores were above 40. The indication for knee arthroplasty was determined based on the study by Dawson et al[15], published in 1998. There was no statistically significant difference concerning the period between the first visit and knee arthroplasty (p>0,05) (Table-4).

Despite the lack of a statistically significant difference, the control group had a relatively shorter time until TKA. As a result, viscosupplementation and arthroscopic debridement did not affect on degenerative process and did not prolong the time until knee arthroplasty. Thus the H^0 hypothesis was refuted.

There was no statistically significant difference between viscosupplementation and arthroscopic debridement groups concerning the VAS and OX-12 scores at the first visit although VAS and OX-12 scores had decreased in correlation to each other. This state of wellness lasted for 2 years but reached the same average values as the control group in the following year. There was no statistically significant difference concerning these values at the 3rd, 4th and 5th follow up visits (p>0,05) (Tables 5 and 6)

As a result, despite an improvement in clinical symptoms such as pain that starts at the 6th month and lasts for two years in viscosupplementation and debridement patients, there was no positive effect on the degenerative process as evidenced by radiological deterioration and the time until knee arthroplasty was not affected.

Discussion

This study aims to investigate the efficacy of NSAIDs, viscosupplementation and arthroscopic debridement which are frequently used for the

treatment of knee osteoarthritis, and to find out if they are effective in prolonging the time until arthroplasty. For this purpose, data was gathered from the patients and their medical records, and the patients were divided into three groups consisting of patients who were given only NSAIDs, patients who were given viscosupplementation, and patients who underwent arthroscopic debridement. Our study is the first to investigate the effects of these three treatment modalities on knee survival. Patients who were given viscosupplementation in addition to arthroscopic debridement and those who received more than one of these treatments were excluded from the study to achieve homogeneity.

When the groups were compared for age, obesity, gender, diabetes, smoking, and their VAS and OX-12 scores in the first admission, no statistically significant difference could be found (p>0,05). All patients were Grade 2 or 3 at the first admission and there was no significant difference concerning the distribution of patients (p>0,05).

Table-5. Distrubation of mean VAS scores according to treatment groups in the various control visit.

VAS Score	Control	Viscosupplementation	Arthroscopic debridement	F	p
First visit	5,0±2,5	5,5±2,4	5,1±2,0	0,619	0,540
6th month	6,0±2,9	4,3±1,4	4,6±2,0	7,890	**0,0001**
1st year	6,9±1,8	4,5±1,4	4,9±2,0	23,673	**0,0001**
2nd year	7,4±1,6	7,3±1,7	7,1±2,0	0,348	0,706
3rd year	8,1±1,5	8,0±1,6	8,1±1,6	0,064	0,938
4th year	8,3±1,4	8,2±1,5	8,2±1,5	0.499	0.608
5th year	8,4±1,6	8,5±1,5	8,3±1,6	0,201	0,818
Last visit	8,9±1,4	8,5±1,5	8,7±1,4	1.997	0,139
r	-	0,989 p>0,05		-	-
p	-			-	-

A total of 142 patients including the control group were evaluated in this study. 87 (61,3%) of the patients had undergone knee arthroplasty. The rate of operation due to total knee arthroplasty indication in the control group which consisted of patients who were given NSAID only, viscosupplementation groups, and the arthroscopic debridement group was 61,5%, 60,4%, and 61,9% respectively. There was no statistically significant difference concerning the average time between the first visit and the knee arthroplasty (p>0,05). The type of total knee prosthesis, postoperative alignment, and clinical outcomes were not evaluated as they were not the endpoints of this study.

The NSAIDs are the oldest and the most frequently used treatment for the primary knee osteoarthritis. Other analgesics and opioids can also be used for the treatment of pain [8]. NSAIDs were proven to be more effective than other analgesics in a study by Rasmussen et al in 2018 [12]. Weight control,

electrical stimulation, physiotherapy agents, and glucosamines are other conservative methods**.** NSAID are strongly recommended for KLC grade-1 primary degenerative arthritis and KLC grade 2-4 cases by the AAOS [13]**.** The NSAIDs, their efficacy, and usage times were ignored as heterogeneous variables since the aim of this study was to investigate the efficacy of other procedures. This could be seen as a limitation that weakens the study. However, the reasons for this limitation are the contraindication for prolonged use of NSAIDs due to systemic toxicity such as hepatotoxicity, cardiotoxicity, gastric irritation, and bleeding, the necessity to alternate drugs those are ineffective for pain, different prescription habits and their combination with other analgesics.

Recent studies report that proinflammatory cytokine levels are increased in primary knee osteoarthritis due to the stimulation of the Substance-P fibers found in the synovia, periosteum, and the adipose tissue by tumor necrosis factor- and interleukin (IL)-6 accelerates the degenerative process [8].

Table-6. Distrubation of mean OX-12 scores according to treatment groups in the various control visit

OX-12 Score	Control	Viscosupplementation	Arthroscopic debridement	F	p
First visit	22,4 ± 5,7	24,5 ± 5,9	23,7 ± 5,7	1,658	0,194
6th month	26,0 ± 6,9	20,3 ± 6,5	20,6 ± 7,0	11.046	**0,0001**
1st year	28,9 ± 5,6	19,5 ± 5,5	19,8 ± 6,0	43.706	**0,0001**
2nd year	31,4 ± 6,8	29,3 ± 6,9	29,2 ± 7,0	1.306	0,274
3rd year	35,2 ± 5,5	35,0 ± 5,6	35,1 ± 5,6	0.019	0.984
4th year	38,3 ± 6,5	38,2 ± 6,6	38,2 ± 6,6	0.004	0,996
5th year	41,4 ± 3,5	41,5 ± 3,4	41,3 ± 3,7	0.082	0.927
Last visit	46,9 ± 2,7	44,5 ± 2,9	45,7 ± 2,7	9.378	**0.0002**
r	-	0,999 p>0,05		-	-
p	-			-	-

NSAIDs inhibit the arachidonic acid synthesis by binding to the cyclooxygenase (COX) enzyme which in turn, inhibits inflammation and alleviates the pain indirectly**.** Gastric bleeding secondary to gastric irritation is the most important side effect of NSAIDs**.** The COX-1 enzyme is found in the platelets while COX-2 is found in the bones, muscles, and soft tissues. Selective COX-2 inhibitors cause less gastric irritation. None of the patients in this study used selective COX-2 inhibitors. The international consensus on the oral and topical use of these drugs was followed in this study [8]. Jersevar et al have proposed naproxen as the cheapest and most effective NSAID in their 2018 systematic review and meta-analysis [14]**.**

Viscosupplementation has gained widespread use in recent years. In the last few decades, the effect of intraarticular injections of corticosteroids, hyaluronic acid, and platelet-rich plasma (PRP) have been studied [6]. The hyaluronic acid injection has been reported to provide the most successful results by delaying, even stopping the degenerative process [2,5]**.** The intraarticular injection of hyaluronic acid promotes cartilage production and reduces the concentration of proinflammatory cytokines thus providing an anti-inflammatory effect **.** The authors stated that there is no evidence on the superiority of one type of hyaluronic acid on another [5]**.** Strand et al has published a meta-analysis and systematic review of literature on Hyalen-20, which has also been used in our study. The authors stated that high

molecular weight hyaluronic acid injections extracted from roosters or produced using genetic technology and approved by the US Food and Drug Administration (FDA) is efficient and safe [5]. Ayhan et al. have reported a medium level of wellbeing for an average of 24 weeks after intraarticular corticosteroid and PRP application but stated that there was no radiological improvement and the clinical improvement disappeared in the course of follow up. They also stated that the histopathologic effects of these treatment modalities are still unclear [4].

Campbell et al have published a systematic review and overlapping meta-analysis in 2016 and reported that hyaluronic acid and viscosupplementation are efficient and safe in the treatment of knee osteoarthritis and the clinical improvement becomes evident in the 26th week [9]. A similar improvement was detected around 26th week in a study involving 4,866 patients from 29 studies [5]. Jevsevar et al, in their systematic review of studies with a high level of evidence, reported only one randomized, prospective, double-blind study on this subject which did not find any statistically significant differences between placebo and hyaluronic acid [10].

The aim of arthroscopic joint cartilage debridement, which is also called arthroscopic abrasion arthroplasty, is to obtain a smoother surface by shaving the joint cartilage or to avoid fibrillation and softening of the cartilage by shrinking it using radiofrequency. This technique was popularized by Johnston in the 1980s. [15,1]. The microfracture technique, which was developed by Rodrigo et al, involves the excision of the cartilage until a spongious bone is exposed in osteochondral defects and drilling into this bleeding area using special awls in addition to arthroscopic debridement. Multipotent cells are expected to migrate into these holes and the area of the chondral defect will heal by itself as a result of chondrofication. The patients are asked not to bear weight on the operated knee for 6-8 weeks [13].

Several studies conducted in the last two decades report successful clinical and functional outcomes with arthroscopic debridement in primary osteoarthritis of the knee. There was a negative correlation between the degree of degeneration and the success of chondroplasty in arthroscopic debridement reported. Steadman et al reported successful results in 87% of arthroscopic debridement patients in 2013 [7]. In our study, VAS and OX-12 scores showed statistically correlated changes starting at 6 months and this improvement in pain and function lasted for 2 years. However, radiological deterioration continued.

It is not known whether the clinical improvement observed as a result of arthroscopic debridement is caused by the lavage and the mechanism is not still clear. Ike et al have compared arthroscopic lavage to NSAID treatment and found a 36% improvement in the NSAID group vs 62% improvement in the arthroscopic lavage group at the 12th week [16]. On the other hand, Chang et al found no statistically significant difference in their 1993 study where arthroscopic debridement and arthroscopic lavage were compared [17]. The results of arthroscopic debridement and microfracture technique are reported to be similar and between 50% and 65% [18]. Krüger et al. in their study where 162 patients underwent arthroscopic debridement and followed up for 40 months, stated that debridement did not contribute to cartilage healing and the inflammatory mediators released as a result of microfracture technique increased cartilage degeneration although a state of wellbeing which lasted for approximately one year was achieved [15]. In 2007, Steadman et al claimed that arthroscopic debridement prolonged knee survival for up to 10 years [11]. Spahn et al, in their meta-analysis published in 2013 where 30 studies with 1512 citations were evaluated, reported good or perfect results in 60 % of the patients. The authors have proposed that arthroscopic debridement delayed the time to arthroplasty, in other words, increased knee survival for 42,7 months [19]. We found that 69,1% of the patients who underwent arthroscopic debridement needed total knee arthroplasty in 6,0±2,1 years and knee survival was 38,1% in this group. In our study, the VAS scores of 42 patients who underwent arthroscopic debridement and/or microfracture technique dropped significantly which continued for approximately two years. None of the patients had any radiological improvements (increase in joint space, a decrease in the number of marginal osteophytes or subchondral cysts, etc.) throughout this period. On the other hand, arthroscopic debridement and microfracture technique did not have any statistically significant effect on the time until arthroplasty ($p>0,05$).

The foremost limitation of this retrospective cohort study is the lack of a double-blinded control, randomization, and prospective study design. Another limitation is the fact that different kinds of NSAIDs was used and for different periods in all groups. Some patients who were radiologically grade-4 did not want to undergo surgery due to fears of unsuccessful results or complications and other social reasons. This increases the knee survival period. Kaplan-Meier survival curves were

not used as this is not a prospective study. However, the duration between the first visit and total knee arthroplasty can be important.

In the light of this study it can be concluded that although viscosupplementation using intraarticular hyaluronic acid and arthroscopic debridement with or without microfracture technique provides a clinical relief which starts in 6 months and lasts for 2 years, they do not prolong the duration until arthroplasty and as such, do not affect on knee survival. A very important point to keep in mind is the clarification of this point when informing the patients.

Acknowledgments

We thank Ms. Cağla Sariturk for the statistical analysis.

Conflict Of Interest

The authors declared they do not have anything to disclose regarding conflict of interest with respect to this manuscript.

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