ARAŞTIRMA / RESEARCH

Status of patients with knee osteoarthritis after intra-articular cortisone injection-a retrospective study

Eklemiçi Kortizon Uygulamasından Sonra Diz Osteoartritli Hastaların Durumu – Retrospektif Bir Çalışma

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ÖZET

Amaç: Bu çalışma farklı fonksiyonel kapasitelerdeki diz osteoartritli hastalara uygulanan eklem içi kortizon uygulamalarının ağrı ve fonksiyonellik üzerine etkisini retrospektif olarak incelemeyi amaçladı.

Gereç ve Yöntem: 2016-2019 yılları arasında semptomatik diz osteoartriti için triamsinolon asetonid ile tedavi edilen 102 hastanın verileri geriye dönük olarak gözden geçirildi. Veriler 40 mg/ay (2 ay süreyle) kortizon enjekte edilen hastaların tıbbi kayıtlarından elde edildi. Hastalar Lequesne Fonksiyonellik İndeksi-LFI skorlarının şiddetine göre üç gruba (Ciddi Handikap, Çok Ağır Handikap, Çok Ağır Handikap) ayrıldı ve demografik bilgileri ile fonksiyonel durumları değerlendirildi. Değerlendirmeler başlangıçta ve 2 ayın sonunda tekrarlandı. Gruplar indeksin ağrı, yürüme mesafesi ve günlük yaşam aktiviteleri alt başlıklarına göre karşılaştırıldı.

Bulgular: Grupların fonksiyonel etkilenim şiddetlerinin yaşla birlikte arttığı tespit edildi. Grup içi analizler neticesinde, ikinci doz enjeksiyonlardan sonra tüm gruplarda ağrı, yürüme mesafesi, günlük yaşam aktiviteleri ve toplam LFI skorlarında anlamlı iyileşmeler gözlendi ($p<0.05$). Gruplar arası analizde ise, ciddi handikap ve çok ağır handikap grupları arasında yukarıdaki parametreler açısından fark yoktu ($p>0.05$). En önemli farklar, çok ağır handikaplı bireyler ile ciddi handikapa sahip olan bireyler arasındaydı ($p<0.05$).

Sonuç: Eklem içi kortizon müdahalesi, semptom şiddeti yüksek olan bireylerde bu semptomları azaltmak için uygulanabilen, kolay ulaşılabilir, düşük maliyetli, etkili bir yöntemdir.

Anahtar Kelimeler: Eklem içi enjeksiyon, kortizon, diz osteoartriti, işlevsellik, ağrı

ABSTRACT

Objective: This study aimed to retrospectively examine the effects of intra-articular cortisone applications on pain and functionality in patients with grade II or III knee osteoarthritis of different functional capacities.

Methods: Data of 102 patients treated with triamcinolone acetonide for symptomatic knee osteoarthritis were retrospectively reviewed between 2016-2019 years. Data were obtained from the medical records of the patients injected with 40 mg/month (for 2 months) cortisone. The patients were divided into three groups (Severe Handicap, Very Severe Handicap, Extremely Severe Handicap) according to the severity of the Lequesne Functionality Index-LFI scores, demographics and functional status were evaluated. Assessments were repeated at baseline and at the end of 2 months. The groups were compared according to the sub-headings of the index: pain, walking distance, and activities of daily living.

Results: The functional impact intensity of the groups increased with age. When compared intra-group analysis, significant improvements were observed in pain, walking distance, daily life activities, and total LFI scores of all groups after second doses of injections ($p<0.05$ for all). In the inter-group analysis, there was no difference between the severe handicap and very severe handicap groups in terms of the above parameters ($p>0.05$). The most significant differences were between individuals with severe handicaps and individuals with an extreme severely handicaps ($p<0.05$ for all).

Conclusion: Intra-articular cortisone is an easily accessible, low-cost, effective method that can be applied in individuals with high symptom severity to reduce these symptoms.

Keywords: Intra-articular injection, cortisone, knee osteoarthritis, functionality, pain

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INTRODUCTION

Knee osteoarthritis (OA) is a common joint pathology usually seen in individuals aged 50 years and over. The incidence of this age group in our country has been reported as 14.8%. [1] Untreated inflammation in bone and subchondral tissue because of the knee OA is the cause of common complaints such as pain, stiffness, deformity, swelling, soft tissue atrophy, incapacity, decreased joint function and health-related quality of life. [2,3] This situation causes severe disability and decreases in activities of daily living. [4-6]

Surgery and conservative methods are used commonly in the treatment of knee OA. [4] Instead of surgical methods, patients seek alternative treatment methods that cause less trauma to the soft tissue. [6] The most popular of these non-surgical methods are physical therapy, intra-articular injections such as corticosteroid, hyaluronic acid, and platelet-enriched plasma (PRP). [7] These interventions have different mechanisms of action. While the hyaluronic acid injection helps control pain by reducing the joint surfaces' contact and limiting the inflammatory process associated with OA, PRP injection modulates the anti-inflammatory, analgesic, and chondrocyte proliferation process thanks to its many growth factors. [8,9] On the other hand, corticosteroids injection plays an active role in suppressing the intra-articular inflammation process. It is also a frequently used treatment regimen for the relief of symptomatic knee OA pain by reducing prostaglandin synthesis. [10] In this aspect, corticosteroids are an inexpensive and tolerable method used to relieve more severe pain compared to some painkillers. [7]

Pain intensity is one of the essential factors in maintaining lower extremity functions. [11] At the same time, pain negatively affects the activities of daily living in knee OA patients. [12] For this reason, it is necessary to evaluate the pain, function, and daily life activities of individuals with knee OA to demonstrate the treatment program's effectiveness. [13-16] Unlike other studies in the literature, this study aims to examine the effects of intra-articular cortisone injection on pain, walking distance and activities of daily living in patients classified according to their functional capacities.

MATERIALS and METHODS

Study Design:

This study was carried out retrospectively and the medical records of 158 patients were reviewed, and the data of 56 patients who had missing medical records and did not meet the inclusion criteria were excluded from the study. Finally; the data of 102 patients with gonarthrosis who had knee pain complaints in a private medical center in İstanbul between 2016 and 2019 were included. Inclusion criterias for the study were [1] being over 38 years old, [2] diagnosed with gonarthrosis according to the criteria of the American College of Rheumatology (ACR), [3] having Grade II or Grade III Kellegren-Lawrence stage in radiological imaging, [4] not using NSAIDs before the first evaluation or not having had an intra-articular injection in the last three months before consulting the clinic, [5] patients who had a total of 2 knee injections in our medical center once a month. Exclusion criteria were [1] having a history of previous knee surgery or trauma, [2] having used oral or intramuscular steroids within one month before or after applying to the clinic, [3] having an infection or systemic disease, [4] receiving physical therapy or spa treatment in the last six months, [5] having a deficiency in medical records.

Data Collection:

The same physician examined anterior-posterior and lateral radiographs of all patients who applied to the clinic with knee pain between the years mentioned above. After the radiologic examination, the physician obtained the demographic data such as gender, age, height, weight, and body mass index of patients with

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Kellegren-Lawrence staging Grade II and III. Lequesne Functionality Index (LFI); It is a scale that evaluates pain during the night and walking, stiffness, daily living activities parameters such as pain when getting up from a chair without support, walking distance, and climbing stairs. This scale has pain, walking distance, and activities of daily living subgroups. The sum of the sub-scores gives the total score of the index. A total score describes the handicap severities. The 1-4 points mean mild severity, 5-7 points moderate severity, 8-10 points severely, 11-13 points very severely, and 14 and above means extremely severe. [17,18]

Assessment and Intervention:

Assessments were made just before the injections and final assessment was repeated one month after the last injection. The patient records were grouped according to the LFI score before the analysis. According to the result; three groups created and there were data of 33 in the severe handicap group, data of 32 in the very severe handicap group, and data of 37 in the extremely severe handicap group. There was no medical record of other LFI subgroups.

The patients were seated with their feet dangling, and the knee was flexed to 90 degrees. After the relevant area was painted sterile, the intraarticular injection was performed using a 38 mm 22-gauge black-tipped needle from the lateral side of the patella. The interventions were made with 40 mg triamcinolone acetonide twice, once every month. The patients kept themselves in the starting position for 5 minutes, and then they were allowed to transfer loads on the joint. Then, the physiotherapist instructed the home exercise program for hip and knee areas.

Statistical analysis

The normal distribution of the data was evaluated using the mean, standard deviation values, histogram graphs, and the Kolmogorov-Smirnov test. Since the data distributions were normal, the mean and standard deviation values were used. For repeated intervention, repeated measures ANOVA analysis was used. Paired Groups T-test was performed for intra-groups analysis. Bonferroni corrected one-way ANOVA test was used to compare the difference of the means between the groups. The statistical error was accepted as $p<0.05$. Simple linear regression analysis was used to examine the predictive factors affecting the scale subgroup. Post-hoc power analysis was performed to determine the power of the study. In this analysis, the eta-square value was found to be 0.130 using the pain subparameter. The effect size was calculated as 0.63 with the eta-square. The power of the study was calculated as 94%.

RESULTS

Participants were divided into three groups according to their LFI scores. The mean age of individuals with severe handicaps was 54.75 ± 11.72 years, individuals with more severe handicaps were 59.62 ± 7.78 years, and participants with extreme handicaps were 64.75 ± 8.11 years. The BMI scores of the groups were33.86 ± 4.24, 35.62 ± 5.00, and 35.85 ± 5.16 kg/m2, respectively. Majority of the participants were female (n=83). Table 1 shows all demographic information.

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Variables		Severe Handicap	Very Severe Handicap	Extremely Severe Handicap
Age (years)*		54.75 ± 11.72	59.62 ± 7.78	64.75 ± 8.11
Height (cm)**		160.60 ± 8.36	159.43 ± 7.93	157.59 ±7.86
Weight (kg)**		86.15 ± 12.16	89.37 ±14.40	88.05 ± 3.80
Total BMI ($kg/m^{2)}$)**		33.86 ± 4.24	35.62 ± 5.00	35.85 ± 5.16
		n	n	n
BMI	Normal	1	1	-
	Overwe-ight	5	3	6
	Obese	27	28	31
Gen der	Female	25	28	30
	Male	8	4	7
*: p<0.05; **: p>0.05				

Table 1. Characteristic of the Patients

Intra-articular cortisone injection caused significant improvement in pain, walking distance, activities of daily living, and total LFI scores in individuals with a severe handicap. There was an 82.30% reduction in the pain subscore after the second injection. Also, the reductions in walking, the activity of daily living, and total score were 42.97, 47.24, and 59.71, respectively (Table 2).

Similarly, significant improvements were observed in all sub-scores and total scores after the second dose of cortisone injection in more severe handicap groups. While the maximum improvement was seen in the pain with 71.82%, the slightest change was %46.81 in the daily life activities. All these improvements were statistically significant. All values of the scores are shown in Table 2.

Improvements in individuals with extreme handicaps also were similar to the other two groups. The most significant reduction was observed in the pain subgroup (72.10%), while a minor improvement was observed in activities of daily living (49.05%). All values are shown in Table 2.

Group	Variables	Baseline	Number of Intervention		% change (Cohen's d)	
			1th	2th	Baseline to 1th	Baseline to 2th
Severe Handicaps	Pain	3.39 ± 0.98	1.36 ± 1.22	0.60 ± 0.89	59.88 (1.83*)	82,30 (2.98*)
	Walking Distance	1.21 ± 0.56	1.12 ± 0.99	0.69 ± 0.58	7.43 (0.11)	42,97 (0.91*)
	Daily Life Activity	4.53 ± 0.82	3.30 ± 1.17	2.39 ± 1.30	27.15 (1.21*)	47.24 (1.96*)
	Total	9.16 ± 0.83	5.78 ± 2.40	3.69 ± 2.13	36.89 (1.88*)	59,71 (3.38*)
Very Severe Handicaps	Pain	4.65 ± 0.70	1.81 ± 1.37	1.31 ± 1.14	60.15 (2.61*)	71.82 (3.53*)
	Walking Distance	2.15 ± 0.80	1.25 ± 0.87	1.03 ± 0.82	41.86 (1.07*)	52.09 (1.38*)
	Daily Life Activity	5.81 ± 0.93	3.90 ± 1.41	3.09 ± 1.33	32.87 (1.59*)	46.81 (2.27*)
	Total	12.62 ± 0.77	6.96 ± 2.85	5.43 ± 2.74	44.84 (2.71*)	56.97 (3.57*)
Extremely Severe Handicaps	Pain	5.70 ± 1.10	2.05 ± 1.59	1.59 ± 1.64	64.03 (2.66*)	72.10 (2.94*)
	Walking Distance	5.08 ± 1.72	2.70 ± 2.23	2.18 ± 1.98	46.85 (1.19*)	57.08 (1.56*)
	Daily Life Activity	6.32 ± 0.56	4.39 ± 1.29	3.22 ± 1.49	30.53 (1.94*)	49.05 (2.75*)
	Total	17.1 0± 2.00	9.14 ± 4.24	7.01 ± 4.09	46.54 (2.40*)	59.00 (3.13*)
*: p<0.05						

Tablo 2. Intragroup LFI Scores Changes of the Participants After Intervention

In both groups; 2 sessions of cortisone treatment applied to individuals with severe and very severe handicap caused similar improvements in pain (p=0.366), walking distance (0.349), activities of daily living (p=0.391), and the total score (p=0.076), but there was no significant difference between the groups. In the group comparisons between individuals with a severe and extreme handicap, the improvement in pain, wal-

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king distance, activities of daily living, and total scores of individuals with extreme handicap were statistically significant compared to the severe handicap group (p=0.001, p=0.001, p=0.032, p=0.001). There was no statistical difference in pain and daily living activities scores in individuals with a very severe and extreme handicap (p=0.090, 0.943). However, a statistically significant improvement was observed in walking distances and total scores of individuals with extreme handicaps compared to individuals with severe handicaps (p=0.001 for both parameters). Means and statistical significance values are given in Table 3.

	Severe Handicaps	Very Severe Handicaps	Extremely Severe Handicaps	
Variables	**Mean* ± SD**	**Mean* ± SD**	**Mean* ± SD**	**p**
Pain	-2.78 ± 1.31	-3.34± 1.23	-4.10 ± 1.67	0.366[a] 0.001[b] 0.090[c]
Walking Distance	-0.54 ± 0.61	-1.12 ± 1.00	-2.89 ± 2.18	0.349[a] 0.001[b] 0.001[c]
Daily Life Activity	-2.13 ±1.49	-2.71 ± 1.59	-3.09 ± 1.53	0.391[a] 0.032[b] 0.943[c]
Total	-5.46 ± 2.15	-7.18 ± 2.81	-10.09 ±3.82	0.076[a] 0.001[b] 0.001[c]

SD: Standard Deviation, *: Differences of Means (2th Month minus Baseline)**, [a]:** Severe Handicap vs Very Severe Handicap**, [b]:** Severe Handicap vs Extremely Severe Handicap, **[c]:** Very Severe Handicap vs Extremely Severe Handicap

Table 3. Mean Changes in LFI Score Between Groups After Injection

DISCUSSION:

The patients included in our study were divided into three groups according to their LFI total scores. According to our study results, pain, maximum distance walked, and activities of daily living were positively affected by the patients who received a total of two doses of corticosteroid injection in two months. After the assessment, it was seen that the improvement rate of individuals with extremely severe handicaps was higher than the other groups.

Osteoarthritis is a slowly progressive disease that causes joint pain, swelling, and limitation of movement. The most important cause of this pathological process is the damage to the cartilage tissue. Corticosteroid receptor deficiency was observed in chondrocyte samples taken from osteoarthritis patients. [19] This makes it difficult to control the pain caused by the inflammatory process. Similar to the literature, we found significant improvements in the LFI pain sub-score. In the study of Güvendi et al., corticosteroids and PRP were applied to patients with knee osteoarthritis. In the second month's evaluations of the corticosteroid injection group, it was observed that the pain decreased significantly. However, this decrease did not continue in the sixth month. In the same study, physical function assessment was performed with LFI, and the result was reported to be the same as for pain. [20] In a study conducted with 67 patients, the effects of intra-articular corticosteroid and PRP injections applied once a month for three months on pain and functional status were examined, and the evaluations were repeated at the sixth month. Both treatment methods were successful in reducing pain, but PRP application caused a further reduction in pain. The function evaluation of the study also states that PRP causes more improvement at the follow-up period. [21] Yavuz et al. reported in their study that a single dose of triamcinolone acetonate created significant differences in reducing pain and increasing functionality compared to the placebo group. In this study, the patients were evaluated at the first, third, sixth, and twelfth weeks, and it was reported that the corticosteroid-administered group caused more improvement than the placebo group in all evaluations. [19] Another study evaluated pain (VAS) and functional status (International Knee Documentation Committee (IKDC)) after corticosteroid injection. The decrease in the participants' pain continued for five weeks, but after the fifth week, the pain intensity started to increase again. While improvements in the IKDC

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score continued until the thirtieth week, it was reported that it approached the initial values at the fifty-eighth week. [22]

In patients with knee osteoarthritis known to have corticosteroid receptor deficiency, an increase in metalloproteinases and cytokines are observed due to cartilage degeneration. Metalloproteinases are molecules that help prevent the infiltration of inflammatory cells. Cytokines are a peptide that is synthesized in the presence of inflammation and causes the migration of T cells and macrophages to the relevant tissue. Corticosteroids help control pain by suppressing these molecules. In our study, the decrease in pain after intra-articular cortisone application can be explained by this mechanism.

The reduction in pain in patients with knee OA is closely related to functional status. [23,24] In our study, the mean age of individuals with an extreme handicap in functionality was higher than the other groups. Pain caused by joint destruction, which is correlated with age, reduces functionality. [25] In addition, handicaps experienced in functionality directly affect daily living activities. For this reason, we think that the first evaluation results in all sub-parameters of our group with extreme handicaps were high. The reductions after treatment did not differ significantly between individuals with very severe handicaps and those with extremely severe handicaps. This situation may be due to the closeness of the group characteristics. However, there were significant differences in the treatment effect between individuals with severe handicaps and those with extremely severe handicaps. These differences may have differed as a result of age-related treatment expectation levels. However, it is difficult to make a clear comment on this subject.

Activities of daily living significantly affect a person's functional capacity. Difficulties experienced in activities such as climbing stairs and squatting reduce people's living standards. [26] The main reason for this is the limitation of knee joint movements due to pain. In our study, we observed improvements in all groups in activities of daily living according to the LFI sub-score. In the study of Nabi et al., intra-articular corticosteroid administration led to improvements in daily living activities. [21] A one-year randomized controlled study reported that PRP injection significantly improved the LFI daily activities sub-score. [27] Other studies report the contribution of both PRP and corticosteroid injection to the daily living activities of patients with knee osteoarthritis. [28,29] Our study had similar results, which supports the literature. According to the study results, two doses of intra-articular cortisone administration caused short-term improvements in pain, walking distance, and activities of daily living.

The results of the study show that cortisone application supports functionality by causing improvements in pain, walking distance and activities of daily living in individuals with intense functional impairment. In this way, cortisone applications can be used as a cheap, accessible, and easy method in cases where pain relievers do not have an effect or physical therapy modalities are insufficient.

Conclusion:

This study supports that intra-articular cortisone intervention improves physical and functional status in individuals with knee OA. According to the results, intra-articular cortisone injection had positive effects on pain, walking distance, and activities of daily living in the short term and this method, which is widely used in clinics, can also be applied to treat knee osteoarthritis as a effective treatment method for those with severe functional impairment.

There are many studies in the literature about corticosteroids administered to patients with knee osteoarthritis. The common point of most of these studies is that they are based on radiological staging or pain inten-

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sity. In future studies, it is recommended to perform randomized controlled studies classified according to the functional status of the patients instead of radiological staging or pain intensity as criteria.

Limitations:

This study has several limitations. One of them, due to the study's retrospective nature, it is difficult to examine the effects of demographic, cultural, and physical characteristics of the participants on treatment with the available data. A secondary limitation is that the study evaluated the short-term effect. A long-term follow-up evaluation would have allowed us to comment more comprehensively on treatment efficacy.

Ethics: Ethical approval was obtained from Marmara University Clinical Research Ethics Committee (ID: 03.09.2021.1066)

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