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Comparison of the Effectiveness of Prolotherapy and Facet Joint Injection in the Treatment of Chronic Low Back Pain: A Retrospective Study

Kronik Bel Ağrısının Tedavisinde Proloterapi ile Faset Eklem Enjeksiyonunun Etkinliğinin Karşılaştırılması: Retrospektif Çalışma

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ABSTRACT Objective: Low back pain is a common public health problem and causes serious socioeconomic losses. The most common etiology is mechanical in origin. Noninvasive treatment methods, such as medication, exercise, and physical therapy, should be applied first. The most commonly used methods among percutaneous interventions are prolotherapy, facet joint corticosteroid injection, and medial branch blocks. In our study, the effectiveness of facet joint injection and prolotherapy procedures was evaluated in patients with chronic low back pain using a visual analog scale (VAS) and the Oswestry Disability Index (ODI). **Material and Methods:** Data from 178 patients who underwent facet joint injection and prolotherapy with a diagnosis of chronic low back pain in our clinic between 2013 and 2019 were evaluated. In the study, 20 mg of methylprednisolone combined with 2-4 mL of 0.25% bupivacaine was used for facet joint injection. 5 mL of 25% dextrose solution was used for prolotherapy injection to the faset capsule. The VAS and ODI results were evaluated and analyzed before and after the procedures. **Results:** Preintervention VAS scores were higher in patients who received facet joint injections than in those who received prolotherapy ($p<0.001$). Facet treatment significantly decreased VAS scores on the first day ($p<0.001$). Prolotherapy became a more effective treatment later, as reflected by VAS scores at 3 months ($p<0.001$). The 3-month ODI scores were higher in patients treated with prolotherapy ($p<0.001$). **Conclusion:** Facet joint injection is considered more effective at relieving symptoms of back pain early in the condition, but prolotherapy provided more benefit, according to long-term VAS scores.

Keywords: Facet joint injection; prolotherapy; low back pain

ÖZET Amaç: Bel ağrısı, toplumda yaygın görülen bir sağlık sorunudur ve ciddi sosyoekonomik kayıplara neden olur. Etiyolojide en sık neden mekanik bel ağrısıdır. İlaç, egzersiz ve fizik tedavi gibi girişimsel olmayan yöntemler öncelikle uygulanmalıdır. Perkütan girişimler arasında en sık kullanılan yöntemler; proloterapi, faset eklem kortikosteroid enjeksiyonu, mediyal dal bloklarıdır. Çalışmamızda, kronik bel ağrılı hastalarda yapılan faset eklem enjeksiyonu ve proloterapi işlemlerinin etkinliği ve farklılıklarını vizüel analog skala (VAS) ve Oswestry Yetersizlik İndeksi [Oswestry disability index (ODI)] kullanarak, geriye dönük olarak inceledik. **Gereç ve Yöntemler:** Kliniğimizde 2013 ve 2019 yılları arasında kronik bel ağrısı tanısı ile faset eklem enjeksiyonu veya proloterapi uygulanan 178 hastanın verileri değerlendirildi. Çalışmada, faset eklem enjeksiyonu için 2-4 mL %0,25 bupivakain ile karıştırılarak, 20 mg metilprednizolon kullanıldı. Proloterapi enjeksiyonu için faset eklem kapsülüne 5 mL %25 dekstroz solüsyonu kullanıldı. Hastaların VAS ve ODI skorları, işlem öncesi ve sonrası takip dönemlerinde değerlendirilerek analiz edildi. **Bulgular:** Faset eklem enjeksiyonu uygulanan olgularda işlem öncesi VAS değerleri proloterapi alanlara göre daha yüksekti ($p<0,001$). Faset tedavisi, 1. gün VAS skorlarını belirgin düşürdü ($p<0,001$). Üçüncü aydaki VAS skorlarına bakıldığında proloterapi daha etkili bir tedavi haline geldi ($p<0,001$). Proloterapi uygulanan hastalarda, 3. ay ODI skorları istatistiksel olarak yüksekti ($p<0,001$). **Sonuç:** Faset eklem enjeksiyonunun, enjeksiyon sonrası erken dönemde hastalığın semptomlarının giderilmesinde daha etkili olduğu düşünülürken, 3. ay takipleri incelendiğinde proloterapinin uzun dönem VAS sonuçları üzerinde istatistiksel olarak daha anlamlı fayda sağladığı görülmektedir.

Anahtar Kelimeler: Faset eklem enjeksiyonu; proloterapi; bel ağrısı

Low back pain is a common and important public health problem, can occur at any age, and causes serious socioeconomic losses. Studies show that 70%-90 of today's society have experienced low back pain at least once in their lives. Although many pathologies can cause back pain, a mechanical problem arising from overuse, injury, or deformity of the normal anatomical structure is the most common cause.[1]

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Treatment of low back pain involves a combined therapy consisting of pharmacological, interventional, surgical, physical, and psychological methods. Typically, noninvasive methods, such as medication, rest, exercise, and physical therapy, should be tried before applying surgical or invasive methods. Surgical intervention should be considered in the presence of an evident degenerative or congenital anatomical pathology when this pathology is the determined source of pain.[2] In recent years, interventional methods have become more common in pain treatments. Percutaneous interventions for low back pain include prolotherapy (sclerotherapy); facet joint corticosteroid injections; medial branch blocks; intradiscal corticosteroid injections; radiofrequency denervation; intradiscal electrothermal therapy; epidural steroid injections; local injections, such as trigger point injections, sacroiliac intra-articular steroid injections, or botulinum toxin injections; chemonucleolysis, adhesiolysis, nucleoplasty and percutaneous intradiscal radiofrequency thermocoagulation.[3,4]

In our study, patients with chronic low back pain were examined before and after different methods of treatment to assess treatment effectiveness. We compared the visual analog scale (VAS) and Oswestry Disability Index (ODI) results from each treatment.

MATERIAL AND METHODS

Data from patients who were treated for chronic low back pain in our clinic between 2013 and 2019 and who were treated with local treatment without surgical indication were retrospectively analyzed after the study had been approved by Ordu University Clinical Researches Ethics Committee (date: 01.10.2020/number: 2020/204). This study included data from 178 patients who underwent facet joint injection and prolotherapy for chronic low back pain. In this study, 20 mg of methylprednisolone combined with 2-4 mL of 0.25% bupivacaine was used for single level facet joint injection. 5 mL of 25% dextrose solution was used for prolotherapy injection to the single level faset joint capsule. VAS and ODI scores of the patients were evaluated before the injection, after the injection (days 1 and 15), and during follow-up (month 3) periods. The VAS and ODI scores of the patients who received prolotherapy were recorded (days 1 and 15 and month 3) and examined. Results were evaluated statistically. Written informed consent was received from all patients, and the study protocol was carried out in accordance with the Declaration of Helsinki and Good Clinical Practice guidelines.

STATISTICAL ANALYSIS

Statistical analysis was performed with SPSS version 21 (IBM). The χ^2 analysis was used for categorical variables, an independent-sample t-test was used for the univariable analysis, and a repeated measures analysis of variance were used for multivariable analyses. The statistical significance level (α) was set at 0.05.

RESULTS

In the statistical analysis, a significant change was found in the VAS results of the patients who underwent facet joint injection to treat chronic low back pain before injection and after injection (Table 1 and Table 2). The pre-intervention VAS values were higher in patients treated with facet injection than in those treated with prolotherapy ($p<0.001$). The VAS scores on day 1 decreased more in the facet injection group than in the prolotherapy group ($p<0.001$). There was no statistically significant difference in

TABLE 1: Incidence difference in gender.

	Gender		
Therapy Type	**Male**	**Female**	
Facet	21	70	91
Prolotherapy	31	56	87
Total	52	126	

TABLE 2: Age group differences.

Therapy Type	n	Mean	SD	SEM
Facet	91	57.32	12.774	1.339
Prolotherapy	87	60.01	12.475	1.337

SD: Standard deviation; SEM: Standard error of the mean.

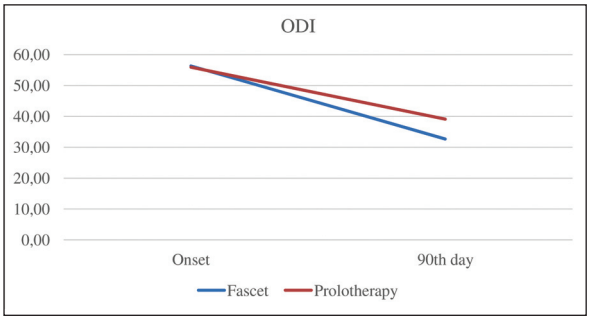


FIGURE 1: Multidimensional statistical analysis showing the Oswestry Disability Index (ODI) score was higher in the prolotherapy group in the 3rd month (p=0.002).

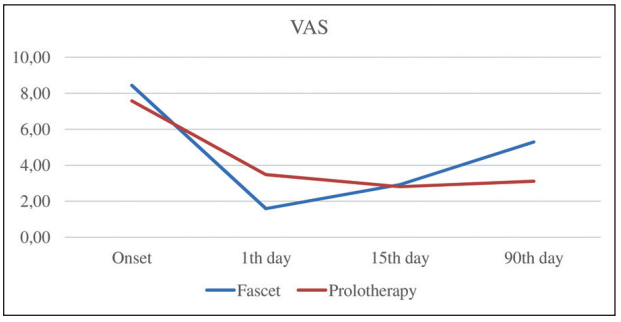


FIGURE 2: Multidimensional statistical analysis showing that the visual analog scale (VAS) of prolotherapy was lower than the score after facet injection in the 3rd month (p=0.001).

TABLE 3: Statistical evaluation of facet injection and prolotherapy groups.

Evaluation	Therapy Type	N	Mean	SD	SEM	p value
Preinjection VAS	Facet	91.00	8.45	0.69	0.07	0.000
	Prolotherapy	87.00	7.57	0.98	0.11	
Postinjection VAS 1st day	Facet	91.00	1.67	0.88	0.09	0.000
	Prolotherapy	87.00	3.48	1.06	0.11	
Postinjection VAS, 15th day	Facet	91.00	3.02	1.45	0.15	0.225
	Prolotherapy	87.00	2.80	0.85	0.09	
Postinjection VAS, 3rd month	Facet	91.00	5.38	1.99	0.21	0.000
	Prolotherapy	87.00	3.11	1.02	0.11	
Preinjection Oswestry	Facet	91.00	56.59	10.74	1.13	0.678
	Prolotherapy	87.00	55.93	10.47	1.12	
Postinjection Oswsetry 3rd month	Facet	91.00	32.85	7.50	0.79	0.000
	Prolotherapy	87.00	39.13	8.11	0.87	

NOTE. Analysis was univariable.
SD: Standard deviation; SEM: Standard error of the mean; VAS: Visual analog scale.

VAS scores on day 15 for the two treatment types (p=0.225). After 3 months, the VAS scores showed that prolotherapy has become a more effective treatment (p <0.001).

There was no pre-intervention difference in ODI scores. (p=0.678). The 3-month ODI scores were higher in patients receiving prolotherapy compared with facet joint injection (p<0.001; Table 3, Figure 1). There was no statistically significant difference in results with regard to age (p=0.157) and gender (p=0.066). Multidimensional statistical analysis showed that the generalized VAS scores after prolotherapy was lower than after the facet injection on the 3rd month (p=0.001; Figure 2). Again, multidimensional statistical analysis showed that the ODI score was higher in the prolotherapy group (p=0.002; Table 4 and Table 5).

DISCUSSION

Low back pain is a clinical condition that is experienced by 80% of people and affects public health to a great extent. The clinical picture of low back pain is quite wide, and the medical and surgical treatment vary widely according to cause.[1-5]

There is no consensus in classification according to duration of pain. However, low back pain that lasts for up to 6 weeks can be defined as acute; for 6-12 weeks, subacute; and for more than 12 weeks, chronic.[2] The vast majority of patients with acute low back pain recover in a few days, though some may take a few weeks. Although 75%-85 of patients with acute low back pain can recover without any treatment within 6-8 weeks, 38% of them have a second attack within a year. In 81% of those with pain, new

TABLE 4: Multivariable analysis of Oswestry Disability Index.

Source	Factor 1	Type III Sum of Squares	df	Mean Square	F	Shallow
Factor 1	Linear	491.261	1	491.261	9.992	002
Factor 1×age	Linear	12.281	1	12.281	250	618
Factor 1×level	Linear	2.419	1	2.419	049	825
Factor 1×gender	Linear	79.676	1	79.676	1.620	205
Factor 1×type	Linear	985.745	1	985.745	20.049	000
Error (factor 1)	Linear	8506.04	173	49.168		

df: Degrees of freedom.

TABLE 5: Multivariable analysis of visual analog scale.

Source	Analysis Type	Type III Sum of Squares	df	Mean Square	F	Shallow
Factor 1	Linear	17.386	1	17.386	11.337	001
Factor 1×age	Linear	205	1	205	134	715
Factor 1×level	Linear	3.947	1	3.947	2.574	110
Factor 1×gender	Linear	485	1	485	316	574
Factor 1×type	Linear	85.851	1	85.851	55.982	000

df: Degrees of freedom.

acute attacks may develop within the same year. The prognosis is generally poor for patients with chronic low back pain, which significantly affects activities of daily living and contributions to the workforce.[1,2] An important treatment goal is prevention of the first acute attack and prevention of chronic pain development.[6,7]

The structures that are the source of pain in the lumbar region are the nerve roots, dural sheath, facet joints, posterior longitudinal ligament, interspinous ligaments, and deep muscles. It is possible to define degenerative and mechanical pain in the lumbar region as myofascial pain, facet pain, sacroiliac joint pain, and discogenic pain according to the region of origin. Back pain caused by facet joints is one of the inevitable consequences of the chronic degenerative process. Often, patients benefit from medical therapy and physical therapy, but clinical complaints often recur.[8] In patients who do not benefit from these treatments, facet joint steroid injections and prolotherapy with hyperosmolar solutions can be effective.[9] Non-surgical treatment options include percutaneous injection methods, physical therapy methods, and medical treatments. Among these methods, the most commonly used ones in clinical practice are facet joint injections and (less frequently) prolotherapy applications. Methylprednisolone and bupivacaine combinations are frequently used in facet joint injection, and hyperosmolar dextrose solution is used in prolotherapy.

Major indications for facet joint injection are tenderness over the facet joint and chronic low back pain with or without spread, accompanied by normal radiological findings, low back pain with disc disease, or facet arthritis. Major signs and symptoms should be supported by a diagnostic block before facet denervation is considered. Facet intra-articular injection is made by reaching into the facet joint with fluoroscopic imaging.[1-3] Facet joint injection is done on at least two sides and two levels. Methylprednisolone and bupivacaine combinations are frequently used in facet joint injection. Methylprednisolone is a type of synthetic glucocorticoid (steroid) drug. Steroids are known to exhibit anti-inflammatory, anti-allergic and immunosuppressive activity and also affect the hematopoietic system. Due to this feature, it is thought to be effective in the long term in the control of pain caused by the facet joint with its local use.[3] In this study, 20 mg of methylprednisolone combined with 2-4 mL of 0.25% bupivacaine was used for facet joint injection.

Prolotherapy is a regenerative treatment method in which an irritant solution is injected into painful ligament and tendon adhesions and adjacent joint spaces in the treatment of chronic musculoskeletal pain. The goals are to reduce pain and accelerate tissue repair and growth. Current hypotheses are that prolotherapy accelerates the local healing of chronically damaged extra-articular and intra-articular tissues.[10] There is evidence to suggest the use of prolotherapy in combination with additional therapies, such as spinal manipulation or exercises in the treatment of chronic low back pain. The most commonly used treatments are 15% dextrose solution for articular injection and 25% dextrose solution for intra-articular injections.[11,12] In this study, 25% dextrose solution was used for injection. Because the main mechanism of prolotherapy is inflammation, steroids and nonsteroidal anti-inflammatory drugs were not used before, during, and at least 2 weeks after treatment. Normal human cells contain only 0.1% dextrose. The increased dextrose concentration after injection leads to an increase in cell protein synthesis, DNA synthesis, cell volume, and cell proliferation.[13] When the extracellular space is exposed to dextrose at a concentration of 0.5%, normal human cells begin to proliferate, and many growth factors are formed, including platelet-derived growth factor, transforming growth factor-β, insulin-like growth factor, and connective tissue growth factor. These are some growth factors involved in the growth and repair of tendons, ligaments, and other soft tissues.[10,14]

There is no practical, formal guideline published on prolotherapy. In our study, we followed a prolotherapy protocol in which a total of 3 weeks of hyperosmolar injection was completed with an interval of 1 week. Comparative studies on applied techniques, application frequency, and injected solutions have not been conducted. Although the most common indication for prolotherapy in publications is chronic low back pain, successful results have been obtained in the treatment of other pain syndromes, including whiplash injuries, lateral and medial epicondylitis, rotator sheath or bicipital tendinosis, plantar fasciitis, coccygodynia, osteoarthritis, temporomandibular dysfunction, and sports injuries.[4,15]

In our study, the VAS and ODI scores of the patients reflected the statistically significant effects of prolotherapy and facet joint injection. Patients who received facet joint steroid injection had better VAS score results on days 1 and 15 compared to those in the prolotherapy group. The 3rd month VAS results of the prolotherapy patients were statistically more significant than the facet joint steroid injection group. This result was thought to be related to bupivacaine, a local anesthetic agent used during facet joint injection. Although facet joint injection was found to be more effective in reducing the symptoms of the disease in the early period after injection, our study found that prolotherapy provided a statistically significant long-term benefit on 3rd month VAS scores (Figure 2).

CONCLUSION

In recent years, minimally invasive interventional methods, such as facet joint injections and prolotherapy have started to take an important place in the treatment of chronic low back pain. Interest in prolotherapy has intensified both among physicians and patients over the past two decades. There are a growing number of published clinical studies confirming the evidence that prolotherapy is effective in treating chronic low back pain. Due to the easy applicability and mechanism of action of the solutions used in prolotherapy, they can be preferred more in practice with their effective results in patients in the long term. Although the prolotherapy method was found to be more effective in the long term when the VAS scores were compared, the facet joint injection method was found to be statistically more effective in the long term when the ODI scores were examined. It was thought that this might be due to the long-term anti-inflammatory effects of methylprednisolone. High methodological quality, placebo-controlled and long-term studies are required to explain the difference and effectiveness between treatment methods.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

This study is entirely author's own work and no other author contribution.

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