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ORIGINAL ARTICLE

Effect of piriformis injection on neuropathic pain

Piriformis enjeksiyonunun nöropatik ağrı üzerine etkisi

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Summary

Objectives: The aim of this study was to investigate the effect of a piriformis injection on neuropathic pain in patients with piriformis syndrome.

Methods: Thirty patients with unilateral hip and/or leg pain, a positive FAIR test (increased H-reflex latency with Flexion, Adduction and Internal Rotation), and a trigger point at the piriformis muscle were enrolled in this prospective study. All of the patients exhibited neuropathic pain scored according to the Douleur Neuropathique 4 (DN4) of ≥4 for at least 6 months. All of the patients received 4 mL of lidocaine 2%+1 mL of betamethazone to the piriformis muscle under the guidance of ultrasound. The Numeric Rating Scale (NRS), DN4, and the painDETECT (PD) questionnaire were used for outcome assessment.

Results: A statistically significant improvement was seen in all scores ($p<0.001$) when both first week and first month results were compared with the baseline values. Comparison of the first week results with those of the first month revealed a statistically significant improvement in only the NRS and PD scores ($p<0.001$). The greatest improvement in all scores was seen in the first week after the injection. A mild increase was seen in all scores at the first month compared to the first week.

Conclusion: A piriformis injection was found to be effective for both somatic and neuropathic pain in piriformis syndrome patients. Long-term follow-up is needed in order to consider this option alongside other treatment alternatives, like botulinum toxin and myofascial release.

Keywords: Neuropathic pain; piriformis muscle syndrome; ultrasound.

Özet

Amaç: Piriformis sendromlu hastalarda uygulanan piriformis enjeksiyonunun hastalardaki nöropatik ağrı üzerine etkisini değerlendirmek.

Gereç ve Yöntem: Tek taraflı kalça ve/veya bacak ağrısı olan, FAIR testi pozitif ve piriformis kasında palpasyonla tetik nokta saptanan 30 hasta çalışmaya dahil edildi. Bu prospektif çalışmada, tüm hastaların Douleur Neuropathique 4 (DN4) skoru en az 6 aydır 4 veya üzerinde idi. Tüm hastalara ultrason eşliğinde piriformis kasına 4 ml lidokain 2% + 1 ml betametazon enjekte edildi. Post-enjeksiyon 1. hafta ve 1. ayda hastalar değerlendirildi. Çalışmamızda, Numerik ağrı skalası (NAS), DN4, PainDETECT anketi (PDA) yöntemlerini kullandık.

Bulgular: Başlangıç değerlerine göre 1. hafta ve 1. ay sonuçları karşılaştırıldığında tüm skorlarda istatistiksel olarak anlamlı düzelme olduğu görüldü ($p<0,001$). Birinci hafta ve 1. ay sonuçları karşılaştırıldığında istatistiksel anlamlı düzelme sadece NAS ve PDA skorlarında görüldü ($p<0,001$). Tüm skorlarda en anlamlı azalma 1. Haftanın sonunda görüşmekle beraber; 1. ay sonunda da hafif bir azalma devam etmekteydi.

Sonuç: Bu çalışmada piriformis enjeksiyonu hem somatik hem de nöropatik ağrı komponenti üzerine etkili bulundu. Uzun dönem takip içeren çalışmalara, özellikle botulinum toksin ve miyofasyal gevşetme gibi diğer tedavi yöntemlerine karar verme açısından, ihtiyaç vardır.

Anahtar sözcükler: Enjeksiyon; nöropatik ağrı; piriformis sendromu; ultrason.

Introduction

Piriformis syndrome (PS) is an underestimated cause of sciatic neuralgia. It was thought that sciatica mostly occurs due to degenerative changes of the lumbar region. PS was first described by Yeoman in 1928.[1] The piriformis is a 'pear shaped' muscle which externally rotates the hip in knee extension.[2] The sciatic nerve goes under the piriformis muscle in the gluteal region. Beaton et al. identified some anatomic variations of the close relationship between the piriformis muscle and sciatic nerve.[3]

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The awareness of PS has increased with prior studies. Correct diagnosis is important because PS is a successfully treatable cause of sciatic neuralgia. PS has both somatic and neuropathic pain components. Somatic pain is commonly related to myofascial origin of PS.[4] On the other hand, hypertrophic and inflamed piriformis leads to the trapping of the sciatic nerve. Mixed pain mechanisms are valid in this syndrome. Maybe chronic PS lead to increase central sensitization and activate the neuropathic pain pathways. In this study we aimed to investigate the effect of piriformis injection on neuropathic pain in patients with PS.

Medical agents such as nonsteroidal anti-inflammatory drugs, muscle relaxants and neuropathic pain agents are first choices in the treatment of PS. Stretching exercises and physical therapy modalities should be added. If conservative treatment methods fail, injections to the piriformis muscle should be done by various methods.[5] Injections can be adminstered by using ultrasound (US), electromyography, computed tomography or magnetic resonance imaging. US-guided injection techniques have been well defined in prior studies.[6–9] Some studies have assessed the effectiveness of US-guided techniques; however, none followed up on patients for neuropathic component.

Material Methods

Study design

This prospective study was conducted in patients with PS in physical medicine and rehabilitation department of a research and training hosiptal. Informed consent was obtained for all patients in this study. All procedures were in accordance with the ethical standards and with the 1964 Helsinki Declaration and its later amendments.

Study population

Thirty patients (n=30) diagnosed as PS with neuropathic pain were enrolled in this study between 02/01/2017-30/11/2017. Diagnosis was based on patient history and physical examination; including trigger point at the piriformis muscle and positive FAIR (flexion, adduction, internal rotation) test. We included the cases between the ages of 18 to 60. Patients exhibiting neuropathic pain according to Douleur Neuropathique 4 (DN4)≥4) for at least 6 months were included. DN4 questionnare was developed by

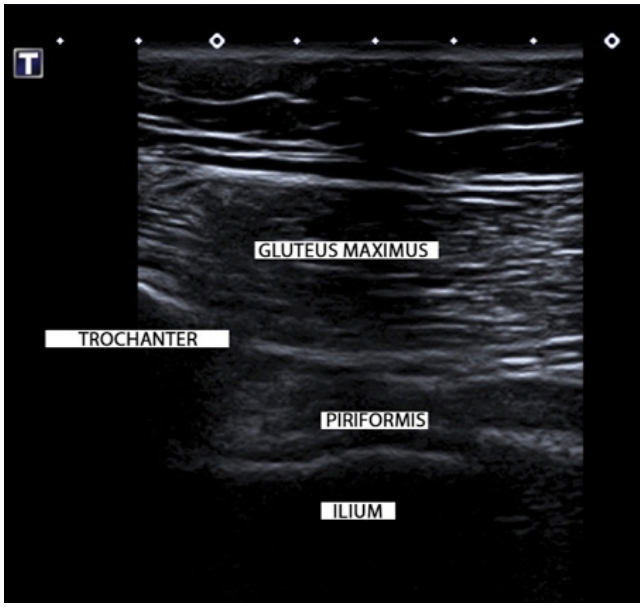

Figure 1. The piriformis muscle as a hyperecoic band under the gluteus maximus muscle.

the French Neuropathic Pain Group in 2005.[10] The Turkish validity and reliability of the DN4 questionnare was made in 2010 with a sensitivity of 95% and a specifity of 96.6%.[11]

The exclusion criteria were having a history of the surgery at the lumbar region, restricted range of the hip or lumbar spine, existing neurological deficiency, active infectious disease or active psychiatric disease. Patients with a history of allergic reaction to the local anesthetics or current anticoagulant use were also excluded.

The mean Numeric Rating Scale (NRS), Douleur Neuropathique 4 (DN4), Pain Detect Questionnare (PDQ) were evaluated at baseline, 1.week and 1. month after the injection. PDQ was developed by Freynhagen et al. in 2006.[12] PDQ is a simple, self-administered questionnaire which was adapted to Turkish language in 2013 by Alkan et al.[13]

Injection technique

All injections were done in prone position. After placing a linear US probe at transverse scan, first sacral hiatus was found. Then the US probe was moved towards the greater trochanter. The piriformis muscle was located as a hyperecoic band under the gluteus maximus muscle (Fig. 1). All patients received 4 ml of lidocaine 2% + 1 ml of betametazone to the piriformis muscle in in-plane technique. All injections were performed by the same physiatrist.

Table 1. Time-dependent changes in the scores

	Mean	SD	p*
NRS-1	7.1	1.1	
NRS-2	2.3	1.9	<0.001[a,b,c]
NRS-3	3.5	1.8	
PDQ-1	22.3	4.0	
PDQ-2	12.8	5.3	<0.001[d,e,f]
PDQ-3	15.0	5.2	
DN4-1	5.1	0.9	
DN4-2	2.5	1.4	<0.001[g,h,i]
DN4-3	2.7	1.5	

SD: Standard deviation; NRS: Numeric rating scale; PDQ: Pain detect questionnare; DN-4: Douleur neuropathique 4; *Variance analyzes in recurrent measurements; [a, d, g]: Comparison of the first and second measurements NRS, PDQ, DN-4 (for all) p<0.001; [b, e, h]: Comparison of the first and third measurements NRS, PDQ, DN-4 (for all) p<0.001; [c, f, i]: Comparison of the second and third measurements NRS, PDQ, DN-4 (respectively) p=0.001; p=0.009; p=0.326.

Statistical analysis

The SPSS 20.0 software bundle was used to analyze the data. variance analysis was used in the analysis of recurrent measurements. Pearson correlation analysis was used for correlations. Statistical significance was set at p<0.05.

Results

Fourty-seven patients with PS were admitted to our clinic between 02/01/2017-30/11/2017. Thirty of them meeting the inclusion criteria were included in the study. The mean age of the patients was 52.7±11.6. The mean duration of the symptoms was 10.9±7.8. The study group was consisted of 20 female and 10 male patients.

When compared to the baseline scores significant decreases were seen in all measurements. The mean NRS scores at baseline, 1st week and 1st month were 7.1, 2.3 and 3.5 respectively. The mean DN4 scores at baseline, 1st week and 1st month were 5.1, 2.5 and 2.7 respectively. The mean PDQ scores at baseline, 1st week and 1st month were 22.3, 12.8 and 15 respectively. The highest decrease in all scores after injection was seen in the 1st week. A mild increase was seen in all scores at the 1st month compared to the 1st week. However all scores were still lower than baseline scores (Table 1). In post hoc analyzes, when compared to the baseline results with both 1st week and 1st month results, statistically significant improvement were seen in all scores (p<0.001). When compared to the 1st week results with 1st month results, statistically significant improvement were seen in only NRS and PD scores (p<0.001).

Table 2. Correlation of NRS, PDQ and DN-4 scores for time-dependent changes

	NRS*		PDQ*	
	r	p‡	r	p‡
Baseline- 1st week				
PDQ	0.657	<0.001		
DN-4	0.636	<0.001	0.578	0.001
Baseline- 1st month				
PDQ	0.617	<0.001		
DN-4	0.706	<0.001	0.442	0.014
1st week- 1st month				
PDQ	0.698	<0.001		
DN-4	0.697	<0.001	0.636	<0.001

*The scores given represent the data of their own group; ‡Pearson correlation analyzes.

When the correlation of the changes in NRS, PD and DN-4 scores were examined, a strong positive correlation was found between NRS and PD; also NRS and DN-4. There was a moderate corralation between PD and DN-4 (Table 2).

Discussion

Pain in PS is usually characterized by two components; somatic and neuropathic. The somatic component is mostly related to myofascial origin while the neuropathic component is related to nerve compression or irritation.[14, 15] In this study we aimed to investigate the effect of piriformis injection on neuropathic pain in PS. Patients exhibiting neuropathic pain according to DN-4 for at least 6 months were included. When compared to the baseline scores significant decreases were seen in both 1st week and 1st month results for NRS, DN-4 and PD. We saw that the piriformis injection is effective not only on the somatic pain but also on neuropathic pain in PS.

The piriformis muscle originates from anterior part of the sacrum then passes through the greater sciatic notch and inserts to the medial aspect of the greater trochanter. The sciatic nerve usually passes through the greater sciatic notch below the pirifor-

mis muscle.[3, 16] While there are still some uncertanities in etiologic factors of PM. This close relationship between the piriformis muscle and the sciatic nerve is the most accepted cause of sciatica in PS. Irritation of the fibular branch of the sciatic nerve commonly leads to pain or paresthesia in the posterior thigh or leg. We evaluated the symptom severity by using NRS, DN-4 and PD.

Neuropathic pain has a greater effect on quality of life of the patients and higher health care costs than the other types of pain.[17] It requires different kind of assessment tools and treatment methods.[18, 19] PD and DN-4 are widely used and accepted questionnares for assessment of neuropathic pain. PD and DN-4 demonstrated a sensitivity of 85% and 83% and a specificity of 80% and 90% respectively, in some studies.[10, 12] Scores of all NRS, PD and DN-4 are positively correlated with each other supporting previous studies. In this studya strong positive correlation was found between NRS and PD; also NRS and DN-4. There was a moderate corralation between PD and DN-4. In a recent study Gudala et al. found good discriminant validity between PD and DN-4.[20]

There is still no definite diagnostic criteria for PS. Piriformis injection is an accepted method for both diagnosis and treatment.[8, 9, 21] Steroid is a widely used medical agent for injection in PS and possitive effect of injection on somatic pain was shown in majority of the studies.[8, 21–24] Our study also showed the reduction in neuropathic pain scores. Because of the quick response to injection, it can be used as a diagnostic tool. But the effect of the duration is still remain unclear. In present study, the highest improvement in all scores after injection was seen in the 1st week. A mild increase was seen in all scores at the 1st month compared to the 1st week. However all scores were still lower than baseline scores. It is our limitation that having a short follow-up period.

Botulinum toxin therapy is also be considered that could be effective for a longer period. Fishman et al. reported that 24 of the 27 patients had a good response to the botulinum toxin injection.[25] Fishman et al. also showed that botulinum toxin provide more pain relief than other agents like steroids.[26] But botulinum toxin therapy should not be considered as the first option in terms of cost effectiveness.

Conclusion

Injection for the piriformis syndrome with steroid, under the guidance of ultrasound was found to be effective for both somatic and neuropathic pain in this study. Long-term follow-up is needed for considering other treatment options like botulinum toxin or myofascial release.

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