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Pulsed radiofrequency in the treatment of coccygodynia

Koksigodini'de pulse radyofrekans tedavisi

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Summary

Objectives: Coccygodynia is a clinical condition characterized by pain and tenderness around the coccygeal region. Trauma is the most common etiologic factor. We aimed to investigate the effectiveness of pulsed radiofrequency (PRF) treatment in patients with coccygodynia that could not be relieved by classic treatment protocols, and we present our long-term results with caudal epidural PRF.

Methods: The study included 21 patients who were treated for coccygodynia by caudal epidural PRF in our Pain Clinic. Sixteen patients (76%) had a history of trauma, three patients (14%) had previous surgery, and two patients (10%) had idiopathic coccygodynia with no identifiable cause. All patients had been previously treated with conservative methods, but none had pain relief. Pain level of the patients was assessed by visual analog scale (VAS) score. A questionnaire to evaluate subjective patient satisfaction was also used at the 3rd-week and the 6th-month follow-ups.

Results: Median VAS score was 8 at baseline, decreased to 2 by the 3rd week and was 2 at the 6th month. VAS at the 3rd week and 6th month were significantly lower compared to baseline ($p<0.001$). At the 6th month, 12 patients (57%) had excellent results, 5 patients (24%) had good results and only 4 patients (19%) had poor results regarding the subjective patient satisfaction questionnaire.

Conclusion: Caudal epidural PRF may be an alternative to surgery for coccygodynia patients who are unresponsive to classic treatment methods.

Key words: Chronic pain; coccygodynia; coccygectomy; pulsed radiofrequency.

Özet

Amaç: *Koksigodini, koksigeal bölgede ağrı ve hassasiyetle kendini gösteren klinik bir durumdur. Travma en yaygın etyolojik faktördür. Biz klasik tedavi protokolleri ile iyileşememiş koksigodinili hastalarda kaudal epidural puls radyofrekans (PRF) tedavisinin etkinliğini araştırmayı ve uzun dönem sonuçlarını incelemeyi amaçladık.*

Gereç ve Yöntem: *Çalışmaya, ağrı kliniğimizde kaudal epidural PRF ile tedavi edilen koksigodinili 21 hasta dahil edildi. Hastaların 16'sında (%76) travma hikayesi, 3'ünde (%14) geçirilmiş cerrahi hikayesi varken, 2'sinde de (%10) nedeni ortaya konamamış koksigodini vardı. Tüm hastalar daha önceden konservatif yöntemlerle tedavi edilmişler ancak hiç birisinin ağrısı yeterince geçmemişti. Hastaların ağrı düzeyi visual analog scale (VAS) skoru ile değerlendirildi. Hasta memnuniyeti 3. hafta ve 6. aylarda subjektif hasta memnuniyeti anketi ile değerlendirildi.*

Bulgular: *Ortanca VAS skoru başlangıçta 8 idi, 3. hafta ve 6. ayda 2 olarak ölçüldü. Başlangıç değeri ile karşılaştırıldığında 3. hafta ve 6. ay VAS değerleri belirgin şekilde düşük bulundu ($p<0.001$). Subjektif hasta memnuniyeti anketine göre hastaların 12'sinde (%57) mükemmel, 5'inde (%24) iyi ve 4'ünde (%19) zayıf memnuniyet sonucu bulundu.*

Sonuç: *Kaudal epidural PRF, klasik tedavi protokolleri ile iyileşmeyen koksigodinili hastalarda cerrahi tedaviye alternatif uygulanabilir.*

Anahtar sözcükler: Kronik ağrı; koksigodini; koksigektomi; puls radiyofrekans.

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Introduction

Coccygodynia characterized by pain and tenderness around the coccygeal region[1-3] mostly occurs around the age of 40 and its incidence is five times higher among women.[2-5] Several etiologic factors cause this entity such as trauma, chordoma and other tumours of coccyx and coccygeal region, perineural cyst, infection, vaginal delivery, anal intercourse, bursitis, obesity, surgery for pilonidal cyst and bicycle riding.[1-6] Among them, trauma is the most common etiologic factor. On the other hand, coccygodynia may be idiopathic in one third of the cases.[7,8] Most common symptom of coccygodynia is pain during sitting or standing up from a chair and coccygeal region is considerably tender.[1] These symptoms may lead to psychosocial problems.[1,6,9] Treatment of coccygodynia includes mainly conservative treatment methods such as NSAIDs, opioid drugs, gabapentin, pregabaline, myorelaxants, postural education, use of special cushion, physical therapy (massage, sitz bath, and electrical stimulation), local anesthetic and steroid injections.[1-3,6,10] Some patients may need surgical treatment such as coccygectomy.[4,5,11-13]

Although there are other interventional treatments relative to coccygodynia, there is no pulsed radiofrequency (PRF) treatment spesifically focused on this disorder.[14-17]

PRF which produces a lesion to nervous tissue by transmission of high voltage current through 27G thermocouple probe has been used as a non or minimally neurodestructive technique alternative to radiofrequency heat lesions. Sluijter[18] has achieved significant pain relief using radiofrequency current at a temperature below 42ºC that produced strong electromagnetic field with no thermal lesion and called this technique as PRF. PRF technique has been used for the management of various types of chronic pain conditions such as pudendal neuralgia, facet syndrome, shoulder pain, post herpetic neuralgia, phantom pain, and artrogenic pain.[19-24] Although it has been previously suggested for coccygodynia, current literature lacks information related to this technique for the treatment of coccygodynia.[18]

In the present study, we aimed to investigate the effectiveness of PRF treatment by presenting long-term results of caudal epidural PRF in patients with coccygodynia that could not be relieved by classic treatment protocols.

Materials and Methods

Patients: In this retrospective study, 21 patients treated by caudal PRF for coccygodynia between May 2007 and January 2010 were enrolled. Following approval by Institutional Review Board, we reviewed patient charts. All the patients having coccygodynia were evaluated and followed-up by the same orthopaedic surgeon and treated by various non-surgical and surgical treatment modalities with limited success. Surgery was performed in five patients in addition to conservative methods with no remarkable improvement. These patients were then referred to our pain department.

After informed consent, local anesthesia around sacrococcygeal junction and coccyx was achieved in all by 1 mg/kg of lidocaine. Patients that expressed pain relief were selected for caudal epidural PRF treatment. Patients were monitorized by electrocardiography (ECG), oxygen saturation (SPO_2) and arterial blood pressure (BPa). Following sedation by 0.02 mg/kg midazolam, patients were draped in prone position. During PRF procedure, plexus coccygeus was aimed since it sensationally innervates coccygeal region which is formed with combining of anterior branches of S4 and S5 spinal nerves and anterior branch of coccygeal spinal nerve. Local anesthetic was injected into the subcutaneous layer and Cosman RFG-1A Lesion Generator (2006 by Cosman

Fig. 1. A radiographic image of catheter which was advanced to the intervertebral region between the foramina S3-S4.

Table 1. Questionnaire for subjective evaluation of the patients

Measure	Outcome
Significant pain relief and improvement in sitting and standing activities	Excellent
Less pain but requires intermittent analgesics	Good
Using the same analgesia as before PRF, only mild or no improvement	Poor

Medical, Inc., Burlington, Massachusetts, USA) RF device with a CMK-10, 10 mm active tip cannula was inserted to caudal epidural region. Confirmation of cannula was done with lateral fluoroscopic image (Fig. 1). Cannula was advanced to the intervertebral region between the foramina S3-S4 with anteroposterior fluoroscopic imaging. Electrode of the RF device was passed through cannula. Impedance measured ranged between 250 to 350 Ohms. Position of the probe was confirmed neurophysiologically. A different feeling (impression, plethora, fullness vs) was observed by the patients when 50 Hz with 0,4 to 0,7 V sensory stimulation was applied. No muscular contraction was produced by 2 Hz motor stimulation up to 2 V. PRF was performed for 180 seconds avoiding temperatures above 42°C. Patients were followed for one hour after the procedure for complications.

Assessment of pain level: Pain level of the patients was assessed in pre- and post-treatment period by visual analog scale (VAS) score. VAS scores were marked by patients on a horizontal scale where "0" indicated painless condition, whereas "10" denoted the worst pain. Patients were informed that it may take up to 3 weeks for complete pain relief and invited for a follow-up visits at the 3rd week and 6th month. Baseline VAS scores (VAS-0), VAS scores at the 3rd week (VAS-3W) and at the 6th month (VAS-6M) of the patients was measured and recorded. Reduction of pain intensity by 50% or more was considered as successful outcome. A questionnaire to evaluate subjective patient satisfaction was also used at the 3rd week and at the 6th month follow-ups (Table 1).[13]

Statistical analysis: Statistical analysis was done with SPSS 11.5 for Windows (Chi, Il., USA). Results were presented as median (min-max) and percentages. The differences between VAS scores were analyzed with Bonferroni adjusted Mann-Whitney U and Wilcoxon signed ranks tests since the data were not normally distributed. A p value of <0.05 was accepted statistically significant.

Results

Median age of study group was 35 (range 18-54) years and median disease period was 36 (range 5-144) months (Table 1). Surgery was performed for coccygodynia in 24% of the patients, but none of them had pain relief. Female to male ratio was 4.25. History of trauma was present in 16 patients (76%); three patients (14%) had surgery for pilonidale cyst and no cause was identified in 2 patients (10%) thus considered as idiopathic (Table 2).

Median VAS score was 8 at the baseline before treatment, after treatment VAS score decreased to 2 by the third week and was measured as 2 at the 6th month. VAS-3W and VAS-6M were significantly lower compared to VAS-0 (p<0.001). However, there was no difference between VAS-3W and VAS-6M scores (p=0.570) (Table 3).

In patients that had failed surgery for coccygodynia and those had not PRF treatment produced similar

Table 2. Demographic data of the patients with coccygodynia

Parameter	Median (Range)	n (%)
Age (years)	35 (18-54)	
Gender (F/M)		17/4 (81/19)
Disease period (month)	36 (5-144)	
Previous surgery for coccydynia (positive/negative)		5/16 (24/76)
Etiologic factor		21 (100)
Trauma		16 (76)
SP surgery		3 (14)
İdiopathic		2 (10)

Table 3. Comparison of baseline VAS scores (VAS-0) with VAS scores at the 3rd week (VAS-3W) and at the 6th month (VAS-6M)

Assessment time of VAS scores	n	VAS scores Median (Range)	p
VAS-0	21	8 (6-10)	
VAS-3W	21	2 (0-10)	<0.001*
VAS-6M	21	2 (0-10)	<0.001*; 0.570**

*: Compared to VAS-0; **: Compared to VAS-3W.

Table 4. Comparison of baseline VAS scores (VAS-0) with VAS scores at the 3rd week (VAS-3W) and at the 6th month (VAS-6M) of patients with and without a history of surgery for coccygodynia

Assessment time of VAS scores	VAS scores of surgery (+) (n=5) Median (Range)	p	VAS scores of surgery (–) (n=16) Median (Range)	p	p
VAS-0	9 (6-9)		8 (6-10)		0.966#
VAS-3W	3 (2-8)	0.043*	1.5 (0-10)	<0.001*	0.177#
VAS-6M	4 (1-8)	0.042*	1.5 (0-10)	<0.001*	0.058#
		0.197**		0.660**	

*: Wilcoxon signed ranks test (comparisions of VAS-0 with (*) and VAS-3W (**); #Mann Whitney U test (use d for comparision of surgery (+) vs surgery (-) group.

Table 5. Success rate of PRF (reduction of VAS score by 50% or more)

	VAS-0 n (%)	VAS-3W n (%)	VAS-6M n (%)
Successful	0	19 (90.5)	17 (81.0)
Failed	21 (100)	2 (9.5)	4 (19.0)

Table 6. Success rate of PRF (subjective patient satisfaction questionnaire)

	VAS-0 n (%)	VAS-3W n (%)	VAS-6M n (%)
Excellent	0	12 (57)	12 (57)
Good	0	7 (33)	5 (24)
Poor	21 (100)	2 (10)	4 (19)

results at the third week and sixth month (p=0.177 and 0.058, respectively) (Table 4). Reduction of pain intensity by 50% or more was considered as successful outcome, success rate of PRF treatment at VAS-3W was 90% and at VAS-6M was 81% when was compared to VAS-0 (Table 5). At third week 12 patients (57%) had excellent results, 7 patients (33%) had good results and only 2 (10%) patients had poor results and at the 6th month 12 patients (57%) had excellent results, 5 patients (24%) had good results and only 4 patients (19%) had poor results regarding subjective patient satisfaction questionnaire (Table 6). There were no complications such as infection, neurological deficit or bleeding related with this procedure.

Discussion

PRF has been used for chronic pain conditions for the last ten years.[19-24] We used this method for treatment of patients with coccygodynia.

In this study, PRF treatment provided 81% successful outcome as measured by VAS scores at the sixth month, when reduction of pain score by 50% or more was considered as a successful outcome. According to subjective patient satisfaction questionnaire 81% patients had excellent and good results at six months.

Success rates of coccygectomy in coccygodynia ranges from 60 to 91%.[3-5,11,12] In a study from our hospital, success rate was reported 84% in 25 patients.[13] Five patients in our study group had continuing pain after coccygectomy. In the present

study, VAS-0, VAS-3W and VAS-6M scores of patients that underwent coccygectomy and those did not were found to be comparable. Patients that had no benefit after surgery were successfully treated by PRF. Sluijter et al. have stated this method to be superior to transhiatal steroid injection and recommended its use for patients unresponsive to surgery.[18] As a minimal invasive procedure, PRF treatment may stand as an alternative to surgery.

PRF treatment had no effect on two patients with idiopathic coccygodynia, as their VAS scores were not reduced by 50% or more; even one patient had increased VAS scores. These two patients were not satisfied with the results as would be anticipated. However, these patients who had not previously told their psychological problems were then referred to psychiatry clinic and diagnosed to have depression. Psychological disorders of these patients were not noticed during the evaluation which would render them inappropriate for PRF treatment. Gauci has not recommended use of this method in patients with psychological disorders and/or drug addicts.[25] Therefore if there is any suspicious of psychological problems with coccygodynia patients they should be underwent multidisciplinary patient evaluation, psychological counselling and potentially cognitive behaviour therapy. Satisfaction of these patients except idiopathic ones and two traumatic patients who had good results at third week and poor results at sixth month suggests that this method may be more appropriate for coccygodynia incited by a traumatic event.

Efficacy of treatment was confirmed by statistically significant reduction of VAS-3W and VAS-6M compared to VAS-0. Similarity of VAS-3W and VAS-6M scores indicates that the effect may be maintained for long term. Sluijter has stated that effect of PRF may last for 4 to 24 months.[18-25] In our study, assessment of efficacy was performed for 6 months. Additionally, one patient that had PRF treatment still has a VAS score of 0 with no any other treatment. This effect lasted for 32 months indicating that PRF may offer a long term therapeutic effect.

Similar to previous studies which have reported mean age for coccygodynia as 40 years and its incidence in females to be 5 times higher compared to males,[2-5] the median age was 35 years and female to male ratio was 4.25 in our study.

Although efficacy of PRF has been clinically documented, its mechanism of action is not fully understood. It has been suggested to alter gene expression in neurons, by means of neuromodulation.[18,25-31] Stimulation of serotonergic and noradrenergic system and induction of descending pathways have also been proposed.[32]

In the publication of Cahana et al.[33] it is stated that there is documentation of more than 1200 patients who have been treated with PRF and no neurological complication was reported. In a recent clinical study PRF was performed to fine dorsal nerves of the penis of patients with premature ejaculation and no functional disorder that would indicate a nerve lesion was determined.[29] We have not observed such a complication in our study either.

In summary, patients with coccygodynia that are unresponsive to classic treatment protocols were effectively treated by caudal epidural PRF method with long term reduction of pain scores. To our knowledge, this retrospective study is the first PRF application for the treatment of coccygodynia. This study suggests the use of PRF with a minimal invasive procedure for this group of patients as an alternative to surgical treatment and it might be an additional option among non-surgical treatment methods. On the other hand, further randomized prospective controlled studies in coccygodynia patients are needed to fully evaluate the effectiveness of PRF.

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