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Pulsed Radiofrequency Application on Sacral Nerve Roots for Pudendal Neuralgia: Two Case Reports and Review of the Literature

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Abstract

Pudendal neuralgia is a common cause of pelvic pain, often difficult to treat with medical management. Nerve blocks can be effective in the short term. Pulsed Radiofrequency application on the pudendal has been investigated in several studies with positive results, however, locating the nerve can be tricky, particularly in overweight patients.

We describe two case reports of pudendal neuralgia where, after a procedure on the pudendal nerve without effect, pulsed radiofrequency was applied to the sacral nerve roots S2-S3 with a combined caudal epidural and intraforaminal approach under fluoroscopic guidance.

Our results suggest that radiofrequency application with this combined approach can be a feasible technique to treat pudendal neuralgia.

Keywords: radiofrequency, pudendal neuralgia, pelvic pain, neuromodulation, sacral stimulation

1. Introduction

The pudendal neuralgia is a debilitating condition caused by a pudendal neuropathy, presenting as pain, burning, sensation of squeezing or torsion of the pelvic floor, the perineum and the genital area. It may occur in either females or males and it may be unilateral or bilateral. The International Pudendal Neuropathy Foundation estimates the prevalence in the world's population around 1/100.000 and the most involved age being 50-70 years (Murer S, Polidori G, Beaumont F, Bogard F, Polidori É & Kinne M., 2021).

The pudendal nerve is a mixed motor and sensory somatic and visceral nerve that originates from the S2-S3-S4 roots in the sacral plexus, it travels anterior to the piriformis muscle, it enters the gluteal region, it passes through the greater sciatic foramen, then between the sacrospinous ligament ventrally and the sacrotuberous ligament dorsally, next it enters the perineal region via the lesser sciatic foramen. Finally, in the pudendal canal (or Alcock canal, in the fascia of the obturator internus muscle), it divides into the inferior rectal nerve, the perineal nerve and the nerve to the clitoris or the penis (Soon-Sutton TL, Feloney MP, Antolak S., 2022; Khoder W & Hale D., 2014).

Common causes of pudendal neuralgia are prolonged sitting position, repetitive hip flexion (generally in athletes, like cyclists), direct trauma (falls, pelvic surgeries, child deliveries), radiation therapy, metastatic lesion and herpes simplex infection (Murer S, Polidori G, Beaumont F, Bogard F, Polidori É & Kinne M., 2021). The most common pathological mechanism is thus the nerve entrapment along its pathway (Murer S, Polidori G, Beaumont F, Bogard F, Polidori É & Kinne M., 2021).

Pudendal neuralgia is often diagnosed after several years, due to the intimate symptoms and the difficult

differential diagnosis with other urologic or gynecologic conditions (Soon-Sutton TL, Feloney MP & Antolak S., 2022).

The diagnosis is mainly clinical and based on the Nantes criteria: the distribution of pain follows the territory of the pudendal nerve (from the anus to the penis or clitoris), the pain is exacerbated by the sitting position, the patient is not awakened by pain at night, there is not objective sensory impairment and lastly the diagnostic pudendal nerve block is successful (Labat J-J, Riant T, Robert R, Amarenco G, Lefaucheur J-P & Rigaud J., 2008). The imaging like CT scan or MRI may be helpful to exclude other diagnosis. The first line treatment consists in pharmacological therapy (NSAIDs, paracetamol, antidepressant and antiepileptics) and physiotherapy (useful for spastic, tender pelvic floor muscles) (Murer S, Polidori G, Beaumont F, Bogard F, Polidori É & Kinne M., 2021). If ineffective, pudendal nerve perineural injections can be performed; under ultrasound guidance the interligamentary space between the sacrospinous and sacrotuberous ligaments or the Alcock canal are targeted and infiltrated with local anesthetics and corticosteroids. A few studies on Pulsed Radiofrequency (PRF) application to the pudendal nerve show its effectiveness in pain control. PRF is a neuromodulative technique which consists in applying short (20 milliseconds) bursts of radiofrequency electrical current to a target nerve.

The effect of PRF application on nerve conduction is complex and not completely understood, it involves alterations in the membranes and morphology of mitochondria, rupture and disorganization of microfilaments and microtubules and a neuromodulatory effect on C and A∂ fibers (Negro A, Agostino V, Gatta L, Somma F, & Tortora F, 2021).

Table 1 summarizes findings from different studies on PRF application on the pudendal nerve.

Table 1. Studies on RF application for pudendal neuralgia

Author, Year	Study	Patients	Guidance	Follow-up	Outcome
Feng Ji, 2021(7)	Prospective	20	US	6 months	88.9% success
Wang, 2022(11)	Retrospective	70	CT	3 months	88.6% success
Krijnen, 2021(8)	Retrospective	29	Blind	4 years	89% success
Collard, 2019(15)	Retrospective	10	CT	6 months	70% success
Fang, 2018(6)	RCT vs Nerve block	70	US	3 months	Effective in 92.1%
Frank, (2019)(16)	Case Report	7	Blind	Various	Pain relief lasting for an average of 11.4 weeks
Kondratov, 2017(17)	Case Series	1	X-ray	6 weeks	>50% Pain Relief for 6 weeks
Ozkan, 2015(18)	Case Series	3	US	6 months	>50% Pain Relief in 66,6%
Hong, 2015(19)		2	US	6 months	100% success
Masala, 2014(10	Retrospective	30	CT	12 months	>50% Mean VAS decrease
Rhame 2009(20)	Case Report	1	Blind	6 months	Successful
Lee, 2009(9)	Case Report	1	X-ray	8 weeks	Successful

The procedure can be done blindly with anatomical landmarks, fluoroscopy, ultrasound (US) or CT guidance.

The US guided technique requires a transgluteal approach, with a linear 12-16 MHz or a curvilinear 7.5MHz

probe, depending on patient's body habitus. The transducer is placed on the sacrospinous ligament, identifying the ischial spine; the pudendal artery and nerve may be recognized and the active tip needle is then inserted to reach the target nerve and perform the PRF (Fang H, Zhang J, Yang Y, Ye L & Wang X., 2018).

Fang et al. performed a randomized controlled trial comparing US guided PRF with the nerve block, demonstrating the longer lasting benefits of PRF (the effective rate is 92% after 3 months) and no increasing in adverse events (Fang H, Zhang J, Yang Y, Ye L, Wang X., 2018). A report on 20 patients treated with PRF of the pudendal nerve under ultrasound guidance shower a mean VAS decrease of more than 50% from baseline after 6 months with a significative increase of sitting time (Feng J, Shuzhuan Z, Caixia L, Yongyan Z & Hua X., 2021).

Transvaginal and transperineal approaches, without US or CT guidance, have been applied, but they are less comfortable for the patient (Krijnen EA, Schweitzer KJ, van Wijck AJM & Withagen MIJ., 2021). A retrospective study on 20 patients treated with a transvaginal PRF approach with an extended follow up at 4 years showed an effectiveness of 89% (Krijnen EA, Schweitzer KJ, van Wijck AJM & Withagen MIJ., 2021). The fluoroscopic guide can be used, mostly helpful in obese patients; it is not possible to locate the pudendal artery with this technique, but the sensory stimulation can guide the needle positioning (Lee SH, Lee CJ, Lee JY, Kim TH, Sim WS & Lee SY, et al., 2009). A CT-scan approach has been described, of course it allows to locate all the structures, but it requires to involve a radiologist, it is more expensive and it exposes both the patient and the operators to high doses of radiations (Masala S, Calabria E, Cuzzolino A, Raguso M, Morini M, Simonetti G., 2014). A large retrospective study investigated CT-Guided pudendal nerve PRF with a success rate of more than 80% with a 3-months follow up (Wang C-L & Song T., 2022). The pudendal nerve stimulation has been successfully applied (Gregory NS, Terkawi AS, Prabhakar NK, Tran JV, Salmasi V & Hah JM., 2020). The sacral neuromodulation and the spinal cord neuromodulation are considered treatments of last resort when the other options, including nerve decompression, have failed to provide adequate pain control. The most invasive treatment alternative is the surgical decompression of the nerve by removing the sacrospinous ligament. (Soon-Sutton TL, Feloney MP, Antolak S., 2022; Pérez-López FR & Hita-Contreras F., 2014) According to literature, a precise treatment algorithm cannot be established because of lacking in control trials and long follow up studies on a sufficient number of patients. Anyhow no major adverse events are reported with any mentioned treatment (Murer S, Polidori G, Beaumont F, Bogard F, Polidori É, Kinne M., 2021; Tricard T, Munier P, Story F, Lang H & Saussine C., 2019).

We describe a new application of PRF targeting the sacral nerve roots from which the pudendal nerve arises, using fluoroscopic guidance and a RF catheter inserted through the sacral hiatus.

2. Case Description

Two women, 58 and 75 years respectively, with chronic pelvic pain and a positive EMG for left pudendal neuralgia, not responsive to conservative treatment, were treated. Both patients gave informed consent to use their data for research purposes. Patients presented with NRS of 8/10 and 7/10 respectively, pain worsened in the sitting position, which they were not able to tolerate for more than five minutes. The first patient was taking oral pregabalin 150 mg twice a day and the second oral amitriptyline 5 mg three times a day.

They both received a PRF treatment on the pudendal nerve of the affected side using an ultrasound guided technique with a transgluteal approach and a 18G 10 mm active tip RF needle.

This procedure was ineffective in both patients. After two months they were proposed with a second attempt of PRF targeted on the sacral nerve roots.

Under topic skin anesthesia and fluoroscopic guidance, a PRF catheter was inserted in the epidural space with a caudal approach reaching the level of S2 foramen and a needle in the left S3 foramen in order to create a selective bipolar electrical field around the fibers of the sacral plexus (figure 1 & figure 2). Paresthesias were elicited with a 50Hz stimulation at 0.4V in the genital and pelvic area. Three cycles of PRF at 42°C, 45V lasting 120 seconds each were performed.

After the procedure 2cc of ropivacaine 0.1% and Dexamethasone 4mg for each target were injected to avoid neuritis.

After 2 hours of postoperative observation the patients were discharged.

After the procedure the patients have been pain free for three months. At six-month follow-up they reported mild pain with an NRS of 3, both have resumed most of their daily activities. They were able to maintain the sitting position for more than twenty minutes without pain. Both patients have stopped oral medications.

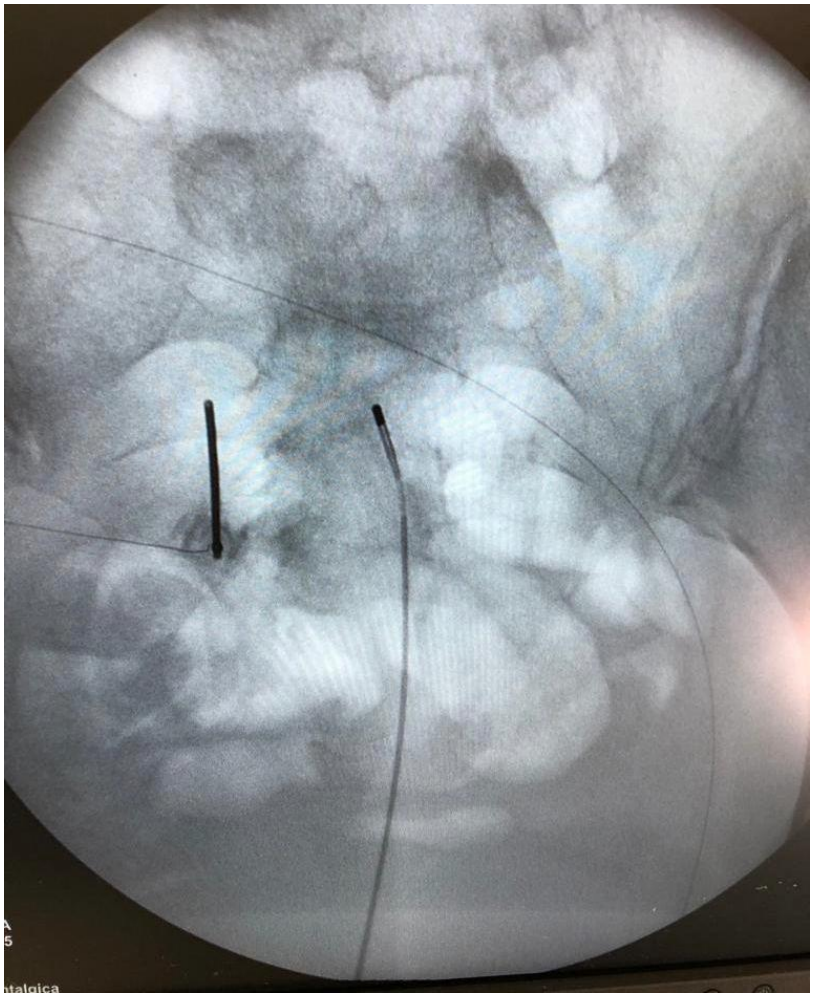

Figure 1. Fluoroscopic Anteroposterior view showing the catheter in the epidural space with the tip reaching S2 and the needle inserted through the left S3 foramen

Figure 2. Fluoroscopic Lateral view showing the catheter in the epidural space with the tip reaching S2 and the needle inserted through the left S3 foramen

3. Conclusions

Pudendal neuralgia remains a complex painful condition which challenges clinicians since treatments are often ineffective.

Scarce data are available on the application of PRF to the pudendal nerve and no data are available on the application of RF to the sacral nerve roots. Different techniques with ultrasound, fluoroscopic, CT guidance or blind have been applied with overall positive results.

Our cases suggest that combining a caudal and intraforaminal approach for PRF on sacral roots results in a localized electrical field, recruiting fibers that originate the pudendal nerve. Fluoroscopic guidance allows easy positioning of the catheter with a caudal approach and the transforaminal insertion of the second needle in the S3 foramen. These patients received a previous PRF on the pudendal without efficacy, we hypothesize that applying PRF more proximally on the sacral nerve roots can be more effective in patients with long lasting pain since mechanisms of central sensitization have been already established. This technique could be a less invasive option for treating pelvic pain due to pudendal neuralgia compared to sacral stimulation and peripheral stimulation of the pudendal nerve.

Declaration of Conflicting Interests

The authors declare that there is no conflict of interest.

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