



Letter to the Editor: Radiofrequency Treatment— Newer Modes and Long-term Effects

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Key Summary Points

This article was written in response to the recently published review entitled “Interventional Radiofrequency Treatment for the Sympathetic Nervous System” to add a few more points on this topic.

Radiofrequency (RF) treatment has gained popularity in recent years, achieving widespread availability in many countries.

Cooled RF and bipolar RF are the more recent modifications of already existing continuous RF (CRF) and pulsed RF (PRF).

The long-term effects of CRF versus PRF remain controversial. Also, set voltages (dose) of PRF may have a major impact on clinical effects.

Comparison between available modalities of RF, particularly their long-term effects, is most certainly a potential topic for future research.

To The Editor,

I read the review article on interventional radiofrequency (RF) treatment for various sympathetic mediated pain conditions (SMP) published in the January 2021 issue of *Pain and Therapy* with profound interest [1]. I have much appreciation for the authors who produced this wonderful review article on this topic. The popularity of RF treatment has been increasing in recent years and has become widely available in many countries. Here, I would like to mention a few additional points on RF treatment which I believe would clarify some of the points raised in the article.

In their review article, Zacharias *et al.* mentioned that two forms of RF procedures, namely continuous RF (CRF) and pulsed RF (PRF), are available [1]. However, two other forms of RF procedures, namely cooled RF and bipolar RF, have also been introduced into clinical practice in the last few years [2–4]. Cooled RF is commonly used to treat chronic knee pain [2], whereas bipolar RF is the preferred treatment for chronic cervical and lumbosacral radicular pain [3, 4]. Although these two latter forms of RF are modifications of CRF or PRF, they differ in their technical aspects and, consequently, produce different clinical effects [2–4]. Hence, I believe they are worth mentioning here.

Zacharias *et al.* also stated that CRF for the treatment of upper extremity CRPS (complex

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regional pain syndrome) has produced longer-term pain relief compared to PRF as the “effects of PRF appeared temporary” [1], citing a few studies to support this statement. However, the retrospective study by Kastler *et al.* [5] compared the simple stellate ganglion (SG) block with CRF treatment of the SG under computed tomography (CT) guidance and observed that CRF was more efficacious than the simple SG block. In contrast, another recently published prospective, randomized study (not cited in the review article of Zacharias *et al.* [1]) observed that PRF treatment of SG produced significantly lower pain scores (i.e., was more effective) than the simple SG block in patients with post-herpetic neuralgia of the face or upper limbs at 1–6 months of follow-up [6]. The main point of contention here is we cannot compare a simple block with RF procedures as we would obtain results in favor of RF only for long-term benefits regardless of whether CRF or PRF was used. Also, the other retrospective studies cited as references for upper extremity CRPS in this review article [1] for the effects of PRF had only short-term patient follow-ups [7, 8]. Hence, it is difficult to speculate or substantiate results on the duration of effects of PRF based on these studies.

Three recently published studies compared CRF and PRF and observed different results; these were at different sites other than the upper extremity [9–11]. Continuous RF (“thermal RF”) of SG was significantly more effective than PRF of SG for the treatment of post-mastectomy pain syndrome in patients who were followed up for 6 months [9]. Also, CRF was significantly more effective than PRF for perineal pain in a study with a follow-up of only 6 weeks [10], while no significant difference was observed in sphenopalatine ganglion CRF versus PRF at a mean follow-up of 68.1 (range 15–148) months, probably the longest follow-up so far in the literature in terms of comparison of CRF and PRF [11]. Furthermore, the magnitude of set voltage (dose of PRF) also could play a major impact on the outcomes of PRF [12]. Therefore, we need a careful analysis of various factors, such as type of study, duration of follow-up, dose of PRF, among other variables, before any conclusion can be drawn from

the results of comparisons between PRF and CRF.

To conclude, the comparison between available modalities of RF, particularly their long-term effects, is certainly a potential topic for further research in the medical speciality area of pain management.

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Compliance with Ethics Guidelines. This article is based on previously conducted studies and does not contain any new studies with human participants or animals performed by any of the authors.

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REFERENCES

- Zacharias NA, Karri J, Garcia C, et al. Interventional radiofrequency treatment for the sympathetic nervous system: a review article. *Pain Ther*. 2021. <https://doi.org/10.1007/s40122-020-00227-8>.
- Gupta A, Huettner DP, Dukewich M. Comparative effectiveness review of cooled versus pulsed radiofrequency ablation for the treatment of knee osteoarthritis: a systematic review. *Pain Physician*. 2017;20(3):155–71.
- Chang MC. Effect of bipolar pulsed radiofrequency on refractory chronic cervical radicular pain: a report of two cases. *Medicine (Baltimore)*. 2017;96(15):e6604. <https://doi.org/10.1097/MD.0000000000006604>.
- Lee DG, Cho YW, Ahn SH, Chang MC. The effect of bipolar pulsed radiofrequency treatment on chronic lumbosacral radicular pain refractory to monopolar pulsed radiofrequency treatment. *Pain Physician*. 2018;21(2):E97–103.
- Kastler A, Aubry S, Saille N, et al. CT-guided Stellate ganglion blockade vs. radiofrequency neurolysis in the management of refractory type I complex regional pain syndrome of the upper limb. *Eur Radiol*. 2013;23(5):1316–22. <https://doi.org/10.1007/s00330-012-2704-y>.
- Ding Y, Yao P, Li H, et al. CT-guided stellate ganglion pulsed radiofrequency stimulation for facial and upper limb post herpetic neuralgia. *Front Neurosci*. 2019;13:170. <https://doi.org/10.3389/fnins.2019.00170>.
- Kim ED, Yoo WJ, Kim YN, Park HJ. Ultrasound guided pulsed radiofrequency treatment of the cervical sympathetic chain for complex regional pain syndrome: a retrospective observational study. *Medicine (Baltimore)*. 2017;96(1):e5856. <https://doi.org/10.1097/md.0000000000005856>.
- Park J, Lee YJ, Kim ED. Clinical effects of pulsed radiofrequency to the thoracic sympathetic ganglion versus the cervical sympathetic chain in patients with upper-extremity complex regional pain syndrome: a retrospective analysis. *Medicine (Baltimore)*. 2019;98(5):e14282. <https://doi.org/10.1097/md.00000000000014282>.
- Abbas DN, Reyad RM. Thermal versus super voltage pulsed radiofrequency of stellate Ganglion in post-mastectomy neuropathic pain syndrome: a prospective randomized trial. *Pain Physician*. 2018;21(4):351–62.
- Usmani H, Dureja GP, Andleeb R, Tauheed N, Asif N. Conventional radiofrequency thermocoagulation vs pulsed radiofrequency neuromodulation of ganglion impar in chronic perineal pain of nononcological origin. *Pain Med*. 2018;19(12):2348–56. <https://doi.org/10.1093/pm/pnx244>.
- Salgado-López L, de Quintana-Schmidt C, Belvis Nieto R, et al. Efficacy of sphenopalatine ganglion radiofrequency in refractory chronic cluster headache. *World Neurosurg*. 2019;122:e262–9. <https://doi.org/10.1016/j.wneu.2018.10.007>.
- Fang L, Tao W, Jingjing L, Nan J. Comparison of high voltage with standard voltage pulsed radiofrequency of Gasserian ganglion in the treatment of idiopathic trigeminal neuralgia. *Pain Pract*. 2015;15:595–603. <https://doi.org/10.1111/papr.12227>.