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RESPONSE TO LETTER

Pulsed Radiofrequency 2 Hz Preserves the Dorsal Root Ganglion Neuron Physiological Ca2+ Influx, Cytosolic ATP Level, Δψm, and pERK Compared to 4 Hz: An Insight on the Safety of Pulsed Radiofrequency in Pain Management [Response to Letter]

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Dear editor

We appreciate the letter sent by Prof. Russo that points out our latest study on the pulsed radiofrequency 2 Hz that preserves the dorsal root ganglion neuron physiological Ca^{2+} influx, cytosolic ATP level, Δψm, and phosphorylated extracellular signal-regulated kinase (p-ERK) compared to 4 Hz[1] and gives his positive suggestion that 2 Hz 20 millisecond pulsed radiofrequency neurotomy, as currently practiced clinically, may continue to be the best option for patients.

Regarding our thoughts on the potential optimization of pulsed radiofrequency neurotomy parameters, we have also performed an in-vitro study by measuring pERK, a sensitization biomarker expressed during pain, following pulsed radiofrequency exposure on the sensitized dorsal root ganglion neuron model induced by N-Methyl-D-Aspartate (NMDA). Our study found that 2Hz 20-millisecond pulsed radiofrequency for 600 seconds significantly decreased the pERK level compared to the control, indicating decreased sensitization.[2] This result shows the scientific evidence that pulsed radiofrequency could directly reduce one of the biological processes of pain generation. However, in clinical practice, the overall outcome of PRF is achieved at two weeks, one month, three months, or six months after the procedure.[3] The time range raises a question on how pulsed radiofrequency clinically works. Therefore, more complex biological parameters related to pain, such as α-amino-3-hydroxy-5-methyl-4-isoxazolepropionic acid receptor (AMPAR) level, transcription factors (ie, neurokinin-1, Cox-2, c-Fos, and TrkB),[4] or pain-related neuropeptides[5] can be assessed to understand the whole pulsed radiofrequency mechanism and obtain potential biological targets to expedite the PRF effect. A time-series study comparing 2 and 4-Hz pulsed radiofrequency can also be done to monitor the parameter's dynamic during a certain time range according to the pulsed radiofrequency clinical efficacy. A study using neuron models induced by other substances, ie, Glutamate, can also be performed to understand the different mechanisms of 2Hz 20 millisecond pulsed radiofrequency.

We thank Prof Russo for his interest in pulsed radiofrequency neurotomy, and we hope that further studies will be done to uncover the pulsed radiofrequency mechanism and provide scientific evidence of pulsed radiofrequency application in pain management.

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Disclosure

The authors report no conflicts of interest in this communication.

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