

Long-term management of idiopathic cough with ultrasound-guided pulsed radiofrequency ablation of the phrenic nerve

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To the Editor: Idiopathic cough is associated with laryngeal hypersensitivity and chronic pain syndromes. Idiopathic cough can be diagnosed when patients have no cause of chronic cough after treatment of cough. Patients with chronic cough experience impaired quality of life (QOL), interruption of daily activity, and depression. Therefore, better approaches to refractory chronic cough are needed.^[1]

The phrenic nerve is an essential structure that is paramount to diaphragmatic function on each side. These arise from the ventral rami of the cervical (C3-5) nerve roots and provide motor innervation to each hemidiaphragm.^[2]

We present ultrasound-guided pulsed radiofrequency (PRF)^[3] of the phrenic nerve for treating a patient with idiopathic cough that did not respond to drug therapy.

A 57-year-old female patient with Graves' disease was referred to our pain clinic with idiopathic cough. Cough started 8 years ago. She was depressed due to idiopathic cough and had impaired QOL. Bronchoscopy, esophagogastroduodenoscopy, pulmonary function test, and chest X-ray showed normal findings. Medication from department of respiratory medicine was not effective. We performed ultrasound-guided phrenic nerve block (PNB)^[4] with 5 mL of 0.4% lidocaine on the left side. The intensity and frequency of daily cough were reduced by 50%. Four days later, the PNB was repeated on the right side; as a result, 90% of her symptoms were relieved. She had a PNB at each side once a week for 2 weeks and at each side once a month for 6 months. After performing PNB, no side effects or changes in chest imaging or related laboratory tests of the patient were observed. Her

symptoms were well-managed. However, at the last block, she showed seizure-like activity after the block. We decided to proceed with PRF of the phrenic nerve on the right side. The patient was in the supine position and was aseptically prepared. Test stimulation was performed at 2 Hz and 0.5 mA. PRF of phrenic nerve was performed at 42°C for 120 s and was repeated for three cycles without complication [Figure 1]. She felt comfortable due to relief from cough for 6 months. We repeated another PRF of the phrenic nerve on the left side with the same method after 6 months. Her symptoms were well managed for 6 months.

A 55-year-old female patient was transferred to our clinic with idiopathic cough. She had difficulty in her daily life with chronic refractory cough for 20 years. Pulmonary function test, bronchoscopy, and allergic skin test showed normal findings. We attempted ultrasound-guided PNB with 5 mL of 0.4% lidocaine on the right side. The frequency and duration of cough were reduced to 50%. PNB was performed on each side alternately every week for a month. There was no adverse effect and change in chest imaging or related laboratory tests of the patient after PNB. The patient reported that the intensity and frequency of daily cough was reduced to 30%. We performed PRF on the phrenic nerve for long-term relief in the same way as above. Her symptoms were well-managed at a 3-month follow-up.

The mechanism of PNB and PRF for idiopathic cough remains unclear. There are a few studies into the relationship between the phrenic nerve and cough. Yanaura *et al*^[5] investigated the response of phrenic nerve activities during the cough reflex in anesthetized dogs. The total discharge activity, spike potential amplitude, and pulse density of the phrenic nerve activities

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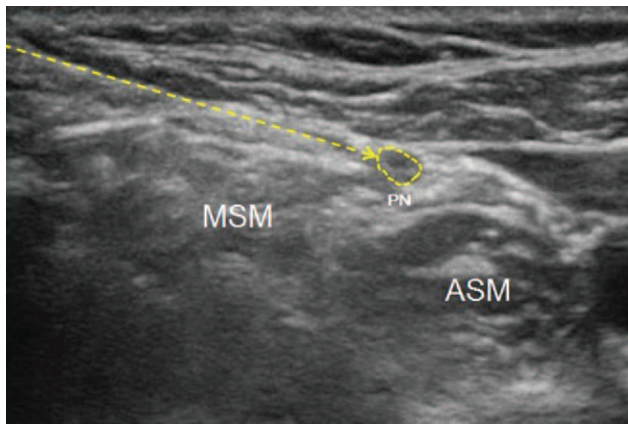


Figure 1: Ultrasound-guided PRF image of phrenic nerve. The yellow dotted circle indicates the phrenic nerve; the yellow arrow indicates the needle pathway. ASM: Anterior scalene muscle; MSM: Middle scalene muscle; PN: Phrenic nerve; PRF: Pulsed radiofrequency.

increased during the cough reflex. The mechanism of nerve block and PRF is to inhibit evoked synaptic activity of excitatory C-fiber in response to repetitive, burst-like stimulation of A δ -fiber and to change structure of nerve tissue. Thus, it might be suspected that PRF of phrenic nerve leads to decreased phrenic nerve activities, resulting in relieving idiopathic cough without complications.

Conclusively, ultrasound-guided PRF of the phrenic nerve is safe and effective in managing idiopathic cough. Further research will be needed.

Conflicts of interest

None.

References

1. Gibson PG, Vertigan AE. Management of chronic refractory cough. *BMJ* 2015;351:h5590. doi: 10.1136/bmj.h5590.
2. Calvo E, Fernández-La Torre F, Brugarolas A. Cervical phrenic nerve block for intractable hiccups in cancer patients. *J Natl Cancer Inst* 2002;94:1175–1176. doi: 10.1093/jnci/94.15.1175.
3. Choi EJ, Choi YM, Jang EJ, Kim JY, Kim TK, Kim KH. Neural ablation and regeneration in pain practice. *Korean J Pain* 2016;29:3–11. doi: 10.3344/kjp.2016.29.1.3.
4. Kang KN, Park IK, Suh JH, Leem JG, Shin JW. Ultrasound-guided pulsed radiofrequency lesioning of the phrenic nerve in a patient with intractable hiccup. *Korean J Pain* 2010;23:198–201. doi: 10.3344/kjp.2010.23.3.198.
5. Yanaura S, Kamei J, Goto K, Hosokawa T, Misawa M, Hukuhara T. Analysis of efferent discharges of the phrenic nerve during the cough reflex. *Jpn J Pharmacol* 1982;32:795–801. doi: 10.1254/jjp.32.795.

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