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Treatment of persistent hiccups with transcutaneous phrenic and vagal nerve stimulation

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Dear Editor,

A 47-year-old male was admitted to the critical care unit after suffering a severe left basal ganglia and intraventricular bleed with hydrocephalus requiring placement of an extraventricular drain and intraventricular lysis using rTPA 4 mg every 12 h for 60 h. The cerebrospinal fluid cleared and subsequent CT scans showed good resolution of the bleed; however, his mental status remained severely reduced. Ventilator weaning

was complicated by recurrent hiccups unresponsive to deepening of sedation, haloperidol, chlorpromethazine and inspiratory hold manoeuvres.

Finally the patient was neuromuscularly blocked with rocuronium but hiccups were only terminated for a short period of time after neuromuscular function returned to normal. The literature was searched for alternative therapies and revealed phrenic nerve and vagal nerve stimulation in patients with chronic hiccups—however, no reports in the critical care setting could be identified.

A transcutaneous nerve stimulator (NMS 300; Xavant Technology, Pretoria, South Africa; Fig. 1) was connected and the current was set to 6 mA. The left interscalene groove was stimulated at a frequency of 1 Hz for 30 s and then a brief tetanic stimulus was applied. Rhythmic contractions of the diaphragm were observed and the patient's heart rate decreased from 95 to 46 beats per minute indicating phrenic and vagal nerve stimulation. He also vomited briefly during the stimulation without further complications. The hiccup ceased immediately and did not

reoccur. Ventilatory weaning was obtained rapidly afterwards and the patient was transferred to a rehabilitation facility.

Hiccups can be a serious problem in the critical care unit, not only creating significant patient discomfort but also delaying weaning from the ventilator due to repeated deepening of sedation, medication side effects and patient–ventilator asynchrony. General anaesthesia has been reported to terminate chronic hiccups in outpatients [1], but failed to relieve the problem in our patient.

Aravot et al. have described the use of non-invasive phrenic nerve stimulation [2] and Payne et al. have reported the use of a vagal nerve stimulator to treat persistent hiccups after a posterior fossa stroke [3]. Based on these reports, transcutaneous stimulation of the nerves was attempted. When interpreting the mechanism of cessation of the hiccup in the present patient, it must remain speculative as to whether the stimulation of the vagal and phrenic nerves or the tetanic contracture of the diaphragm was the decisive point in treatment success. Described methods of treating hiccups seem to have in common that they interfere with the reflex arches at different neuronal levels either centrally or peripherally (centrally acting drugs, inspiratory holds, acupuncture etc.).

The potential side effects most relevant to the critically ill are bradycardia and vomiting. Both were observed in our patient without negative implications. To avoid complications from vomiting feeding should be stopped and in case of intubated patients the cuff of the endotracheal tube should be fully inflated. Atropine should be at hand in case of severe bradycardia.

Conflict of interest None.



Fig. 1 Nerve stimulator (Xavant NMS 300) with nerve mapping electrode

References

1. Lierz P, Felleiter P (2002) Anesthesia as therapy for persistent hiccups. *Anesth Analg* 95:494–495
2. Aravot DJ, Wright G, Rees A, Maiwand OM, Garland MH (1989) Noninvasive phrenic nerve stimulation for intractable hiccups. *Lancet* 28:1047
3. Payne BR, Tiel RL, Payne MS, Fisch B (2005) Vagus nerve stimulation for chronic intractable hiccups. Case report. *J Neurosurg* 102:935–937

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