

Transcutaneous vagus nerve stimulation: A treatment option in drug resistant epilepsy?

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Vagus Nerve Stimulation

Adverse effects:

- Voice alteration (37-66%)
- Cough (7-45%)
- Pain (17-28%)
- Dyspnea (6-25%)
- Headache (2-24%)

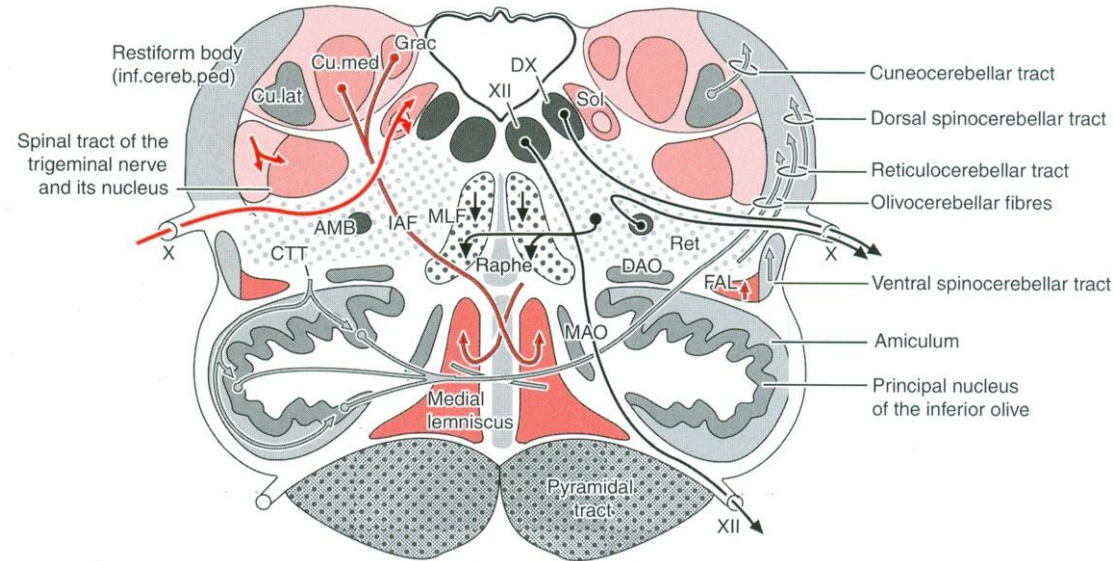
Randomized controlled trials:

Neurology 45: 224-230, 1995

Neurology 51: 48-55, 1998



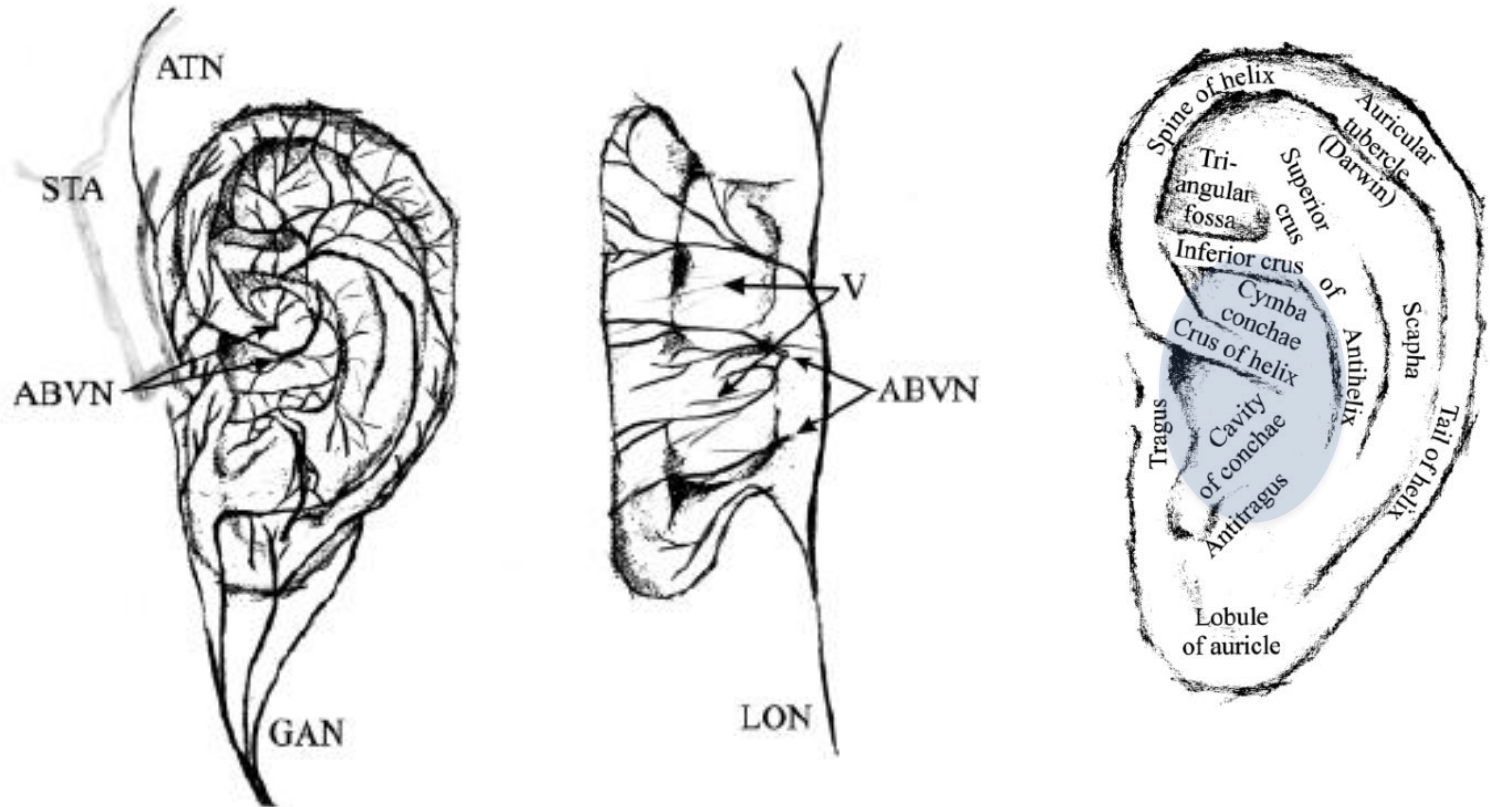
Nucleus of the solitary tract



The nucleus of the solitary tract (NST)

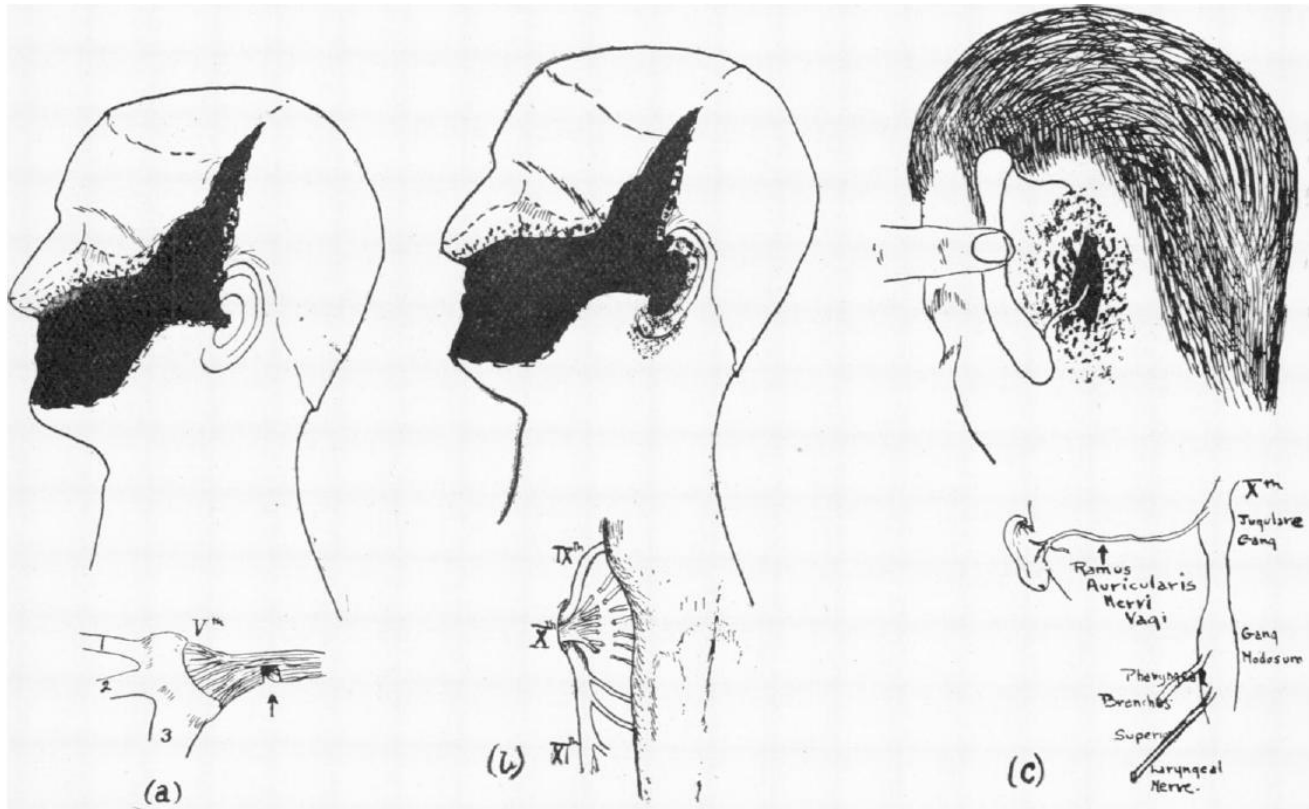
- is a major sensory nucleus in the dorsal medulla.
- receives cardiovascular, visceral, respiratory, gustatory, and **orotactile** information.

Auricular Branch of Vagus Nerve, ABVN



- 14 ears of 7 cadavers
- Each branch defined by identifying its origin

Nerve supply of the external ear: Neurosurgery



Isolated vagus nerve palsy with herpes zoster

- Painful herpetic vesicles in right concha and posterior wall of external auditory meatus.
- No affection of other cranial nerves.

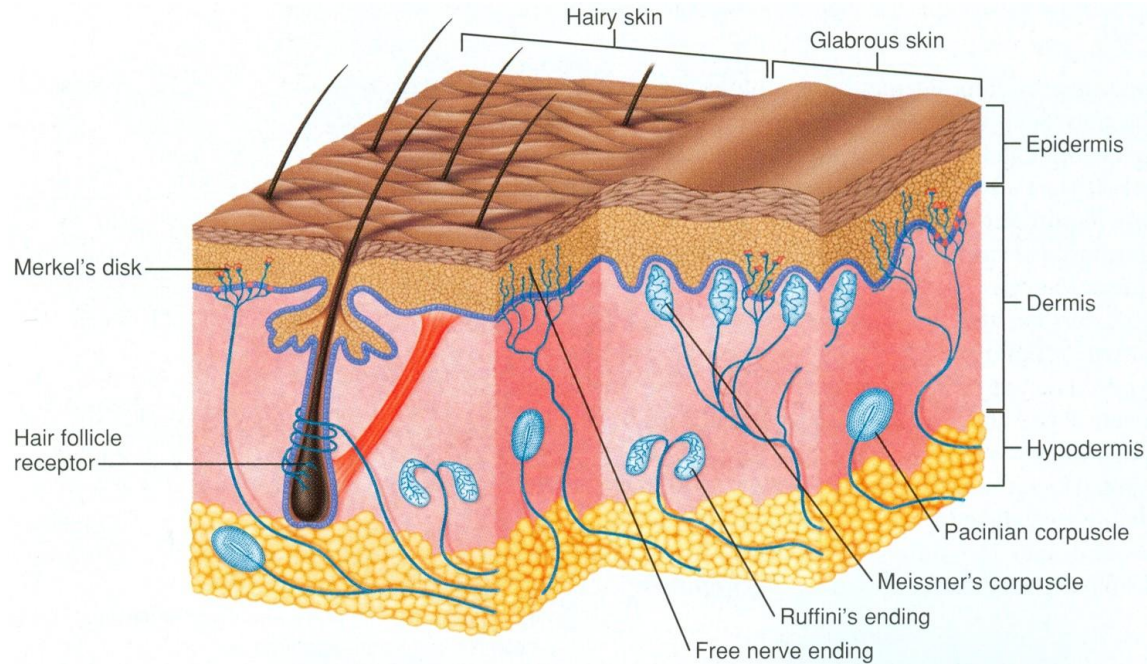


Transcutaneous stimulation of ABVN (t-VNS®)



- Transcutaneously applied.
- Excites ABVN by a novel electrode placed on outer ear surface.
- Approved safety and feasibility in more than 100 patients and volunteers.

Excitation of A β fibers by t-VNS



- Mechanical detection threshold: 0.5 ± 0.7 mN (n=14)
- Electrical detection threshold: 0.8 ± 0.3 mA (n=36)
- Tingling sensation

t-VNS: A treatment option in epilepsy?

- EEG recording of pharmacologically-induced seizures in rats.
- Both invasive and transcutaneous VNS substantially reduced seizure activity as compared to control.
- No significant differences between seizure reduction through invasive and transcutaneous VNS.

He et al., Society for Neuroscience Abstracts, 39th Annual Meeting, 539.4

- Pilot study in drug resistant epilepsy.
- Seven patients completed nine month treatment with t-VNS.
- Five responders showed reduction of seizure frequency between 23 and 48%.

Stefan et al., unpublished data

Summary & Conclusion

- The concha of the external ear is supplied by the vagus nerve.
- t-VNS is feasible and safe.
- Invasive VNS and transcutaneous VNS similarly suppress epileptic seizures in rodents.
- t-VNS reduces seizure frequency in patients suffering from drug resistant epilepsy by approx. 23 to 48%.
- Future indications of t-VNS[®] may be chronic pain, mild cognitive impairment and tinnitus.