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Pathway by which Vagus Nerve Stimulation of B Fibers Affects Heart Rate

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ABSTRACT

Heart failure (HF) affects over 5 million adults in the United States. Many HF patients have a high resting heart rate, which is correlated with a high mortality rate. In recent years, vagus nerve stimulation (VNS) has become an increasingly researched therapy to reduce the resting heart rate of HF patients. However, current dosage given during VNS is increased incrementally at the doctor's office until side effects present themselves in a patient. In addition, the means by which the therapy works is not completely understood. To better understand the therapy's mechanisms, the right cervical vagus nerve of several Long Evans rats was exposed and cuffed. Autonomous Nerve Control (ANC) was utilized to activate various percentages of B Fibers, which have been found to be the most influential fiber on heart rate. After the first round of stimulation, a vagotomy was performed superior to the stimulation cuff on the nerve, and the stimulation was repeated. Initial experimentation was performed to confirm the electronics set-up and the surgical approach as well as ensure that a decrease in heart rate could be achieved with stimulation. Further experimentation is still needed to fully characterize the relationship between VNS and heart rate both before and after vagotomy. Knowing the pathway by which VNS affects heart rate can give further insight into how VNS treatment works. Additionally, further research needs to be performed to characterize the interaction between VNS therapy and drugs routinely prescribed to HF patients.

KEYWORDS

Vagus Nerve Stimulation, Heart Failure, Vagotomy, Bradycardia