

Modulation of the Inflammatory Response: A Potential Novel Use for Vagus Nerve Stimulation Sudhakar Vadivelu DO; Megan McCarty BS; Sangeeta Chavan; Sara Stream; Kevin J. Tracey; Ashesh Mehta MD

Introduction

The neural modulation of the immune response is thought to be mediated, in part, through the vagus nerve. Prior studies in experimental animals have shown vagus nerve stimulation to modulate cytokines response to inducers of inflammation. Tumor necrosis factor (TNF) is a cytokine that is known to play an important role in the pathophysiology of sepsis and other inflammatory disorders. The production of TNF in response to endotoxin challenge can be used as an index of the magnitude of the inflammatory response. We studied 7 patients who underwent vagus nerve stimulation for epilepsy to investigate for changes in TNF induction and this response over time.

Methods

We conducted a prospective clinical study recruiting patients with intractable epilepsy who underwent vagus nerve stimulator implantation. Peripheral whole blood was drawn on the day of surgery at four time points peri-operatively (timed before and after intraoperative stimulation): 1. prior to anesthesia, 2. after anesthetic induction and anterior cervical dissection, 3. after vagal nerve stimulation in situ, and 4. four hours after vagal nerve stimulation. On each follow - up clinical visit a before and after vagus nerve stimulation blood draw was obtained. Whole blood samples were stimulated with endotoxin lipopolysaccharide concentrations 0.1, 1, and 10ng/mL-1 ex vivo. TNF responses were recorded.

Results

Seven epileptic patients consented to the study (male = 4, female = 3). Four patients (4/7 [57%]) demonstrated TNF response suppression after direct vagus nerve stimulation intraoperatively. We found 4/5 [80%] patients (2 patients without followup) with serial followup visits to sustain chronic suppression of inflammatory responses. No patients experienced intraoperative complications or developed adverse events from serial phlebotomy.

Conclusions

Results here support the theory of a direct link between the brain and systemic inflammation via the vagus nerve in humans. This paves the way for the use of vagus nerve stimulation as treatment for inflammatory disorders.

Learning Objectives

1. Pathophysiology of neuromodulation of systemic inflammation

- 2. VNS activity and effects on TNF
- 3. Novel use of VNS for inflammatory disorders

[DEFAULT POSTER]