VAGUS NERVE STIMULATION FOR TREATMENT OF RHEUMATOID ARTHRITIS

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THE PROBLEM

• Rheumatoid arthritis (RA) is an inflammatory disease that affects about 1.3 million adults in the United States.

• This chronic illness is caused by an inflammation in the synovial fluid in the joints and causes severe discomfort due to the destruction of cartilage and bone loss and even shorten life expectancy.

• Typical treatment is medication such as glucocorticoids, methotrexate, and monoclonal antibodies that target mechanisms that cause the inflammation.
VAGUS NERVE STIMULATION

- Past research has shown that vagus nerve stimulation can decrease symptoms in patients with epilepsy and depression, so scientists explored its abilities further.

- Researchers and clinicians discovered that the vagus nerve has the inflammatory reflex which means it has the ability to cease the production of inflammatory factors like cytokines and tumor necrosis factor (TNF).

- By electrically stimulating the vagus nerve and decreasing the presence of inflammatory units, the consequences of rheumatoid arthritis can be significantly reduced.
• The vagus nerve innervates the visceral organs of the body and is one of the largest nerves in the body, earning it the nickname “the highway of the nervous system”

• Scientists implanted a stimulator that would act on the vagus nerve and send electrical impulses on its pathway
  • These pulses target and inhibit the production of TNF which causes the swelling in the synovial joint capsules
  • Patients were given 4 stimulations daily, over an 84 day trial period (there were days when the stimulations were stopped to test for the rise of the TNF in blood samples)
The stimulator has two components:

- One is a pulse generator that is implanted into the left chest of the patient
- The other is a subcutaneous lead with two helical electrodes and an anchor. This segment directly contacts the vagus nerve to deliver the stimulation

In the trial the pulse generator was controlled by the directors of the study in order to deliver accurate results regarding the effectiveness of the stimulation.

The generator uses a lithium thionyl chloride battery which is best suited to carry out the rapid pulses needed, similar to those used in the pacemakers.
THE RESULTS

• There was a control done on patients without RA to show that the stimulation itself does reduce the presence of TNF that was successful

• RA patients had their blood taken before and after the vagus nerve stimulation and the blood test showed a decreased presence of TNF

• Patients showed decreased swelling and discomfort after several days of applied stimulation
• DAS28-CRP is a method of measuring swelling in patients
LIMITATIONS

• Vagus nerve stimulation for RA is only in clinical trials at the moment
• Potential cost of the stimulator device
• Life span of the implant
• With any surgical procedure there is always a risk such as infection
• Once stimulation treatment ends the presence of TNF increases severely
  • Would need consistent electrical therapy
FUTURE

• They would hope to apply this method to other inflammatory diseases, such as Crohn’s Disease which are also related to a TNF inflammation

• Get this method out of clinical trials
  • the VNS pulse is approved for treatment for depression and seizures but they would like to expand that window to RA patients

• Make VNS device more accessible
REFERENCES


