REFRACTORY EPILEPSY AND VAGUS NERVE STIMULATION: THE WAY FORWARD

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Introduction:
Vagus Nerve Stimulation (VNS) an efficacious neurophysiological modality of treatment for both medically & surgically refractory epilepsy was first implanted in 1988 & later approved by US FDA in 1997. In clinical practice, trains of current are applied intermittently to the left vagus using a pacemaker or AICD like device ‘the VNS device’. The device has four components pulse generator, lead, spiral electrodes & a magnet. The pulse generator is implanted beneath left clavicle by a simple surgical method & attached to left vagus nerve via lead & spiral electrodes.[1] The magnet provides an extra edge to control the aura or impending seizure by providing ‘On Demand’ stimulations. The poor cardiac innervation by left vagus helps to minimize the unwanted or at time dangerous side effects like severe bradycardia, brady arrhythmia, or even cardiac asystole.[2]

Indicated in patients with refractory partial or generalised epilepsy (age above 12-14 years) the VNS is considered to be adjuvant to antiepileptic drugs. In clinical practice no particular seizure type or epilepsy appears particularly sensitive or resistant to VNS. Although the precise mechanism of action of VNS remains to be elucidated, the proposed mechanism translates a continuous, lower frequency, intermittent stimulation of vagal nerve nuclei leads to widespread activation of subcortical & cortical pathways increasing the seizure threshold thus producing antiseizure activity. This wide spread activation leads to positive neurobiological effects with increase in alertness, energy, memory and an overall improvement in quality of life.[3]

The device is never implanted in individuals with previous left or bilateral cervical vagotomies and those with progressive intracerebral disease. Caution should be exercised in patients with vasovagal syncope, asthma, cardiac arrhythmia, gastric ulcers and coexisting neurological disease other than epilepsy.

Innervation of larynx by vagus nerve is responsible for temporary and reversible adverse effects like hoarseness, throat irritation or paresthesias, cough and shortness of breath but vagal nerve related ones are more complicated or even life threatening like bradycardia, arrhythmia and even cardiac asystole. Most of these cardiogenic side effects are due to over stimulation.[4]

The implanted device carries lot many unmatched benefit as compared to any antiepileptic as the device work 24×7x365 days without altering serum concentration of drugs in use & does not carry potential of drug interaction. On the other hand the positive neurobiological effects in form of increase in memory, alertness, energy have a positive effect & thus help to attain an overall better quality of life.[5] The lack of cognitive or central nervous system effects adds to its beneficial effects. The device also carry an unmatched quality to deliver on demand stimulation (by magnet) to control aura or impending seizures. This extra benefit is not seen with any antiepileptic drug.

The overall efficacy of VNS is variable but it increases over time. A good no. of patients around one third demonstrate more than 50% reduction and next one third shows 30-50% reduction while the remaining does not show any change in seizure frequency.[6] The cost of VNS device is around ten to twelve thousand USD and the life of battery is 7-8 years depending upon stimulation (low or high) setting.[7] Apart from it use in adult or childhood epilepsy the future application of VNS extends to adult diseases like chronic depression, pain & alzheimer’s disease. Overall the VNS is an efficacious, safe but relatively costly, palliative modality of treatment for childhood to elderly neurological disorder.

References
