Vagus nerve stimulation for super refractory status epilepticus

see also Vagus nerve stimulation for drug-resistant epilepsy.

The treatment protocol for refractory status epilepticus is intensive and includes benzodiazepines, anticonvulsants, and eventually anesthetics for induced coma when polypharmacy is exhausted [1].

If seizures continue or recur after 24 hours following treatment with anesthetics, it is termed super refractory status epilepticus (SRSE). Because of high mortality with polypharmacy and continuous anesthetic use, there has been a great interest to use nonmedicinal devices like VNS [2].

Systematic review

One study reviewing current literature on all cases of VNS use in SRSE identified 17 studies in which a total of 28 patients were treated [3].

Case reports

Kurukumbi et al. presented the case of a patient with new-onset refractory status epilepticus (NORSE) whose seizures were successfully treated with vagus nerve stimulation. A 25-year-old male with no history of epilepsy or other neurological disorders presented with altered mental status and generalized tonic-clonic seizures following a two-week history of an upper respiratory tract infection. Lumbar puncture showed neutrophilic pleocytosis, and he was treated for bacterial and viral meningoencephalitis. In spite of treatment, his seizures began increasing in frequency. On day three, the patient entered status epilepticus (SE) refractory to intensive pharmacotherapy with maximal doses of valproate, levetiracetam, and propofol. On day four, SE remained refractory, so pentobarbital was introduced with a targeted burst suppression pattern on electroencephalography (EEG). The patient continued to be refractory to these measures, so a vagus nerve stimulator (VNS) was implanted (day eight). Following VNS implantation, EEG demonstrated significant reduction of seizure activity and subsequent magnet swiping continued aborting electrographic seizures. No SE or electrographic seizures were reported for seventy-two hours, but few occasional discharges were reported. Seizures eventually recurred on day fourteen and the patient succumbed to his multiple comorbidities on day seventeen. Due to the efficacy of VNS in refractory epilepsy, there was interest in using it in refractory status epilepticus. Multiple case reports have described a benefit from implantation of VNS in the treatment of SE. The successful use of VNS to acutely terminate status epilepticus for seventy-two hours in this critically ill patient adds to current evidence that there is utility in using VNS for refractory status epilepticus [4].

New-onset refractory status epilepticus treated with vagus nerve stimulation: A case report [5].

A 67-year-old patient who developed refractory status epilepticus within days after the evacuation of a right-sided spontaneous subdural hematoma. He was refractory to multiple antiepileptic agents and phenobarbiturate- and propofol-induced coma. He then underwent a left vagus nerve stimulator (VNS) implantation. Within a few days of implantation, he improved dramatically. Within 2 weeks of VNS implantation, he was neurologically intact and was transferred to an inpatient rehabilitation facility. Within a short time thereafter, he was fully functional and able to take care of all of his activities.

A vagus nerve stimulator should be considered in cases of refractory status epilepticus, regardless of age. An excellent outcome can be achieved even if a short course of medication-induced coma is unsuccessful [6)].

A 23-year-old man was in SE for 3 weeks without being able to be weaned from intravenous anesthetic agents. After implantation of a vagal nerve stimulator, SE soon terminated, and the patient could be weaned from sedative agents and made a full recovery.

Vagal nerve stimulator should be considered in cases of refractory SE [7)].

A 7-year old girl with a medical history of thrombosis in the right internal cerebral vein and right thalamic bleeding 8 days after birth, developed epilepsy at the age of 13 months. At the age of 6 she presented with a refractory non-convulsive SE. A vagus nerve stimulator was placed after 11 days of thiopental-induced coma. Three days after VNS implantation, the thiopental-induced coma was successfully withdrawn and electroencephalography showed normalization one week after start of VNS. After a follow-up of 13 months she remains seizure-free and AEDs have been partially tapered. This case illustrates a potential acute abortive effect with sustained long-term seizure reduction of VNS in a 7-year old girl who presented with refractory non-convulsive SE [8)].

A 30-year-old man with medically intractable seizures including episodes of SE was successfully treated using left VNS. After requiring discontinuation of phenytoin, valproic acid, carbamazepine, and topiramate because of severe allergic reactions resembling Stevens-Johnson syndrome, the patient required pentobarbital coma along with phenobarbital, tiagabine, and levetiracetam for seizure frequency reduction. He underwent left vagal nerve stimulator placement after nearly 9 days of barbiturate-induced coma, with stimulation initiated in the operating room. On the following day, electroencephalography revealed resolution of previously observed periodic lateral epileptiform discharges and the patient was free of seizures. Prestimulation seizure frequency was recorded at 59 times a day, with some seizures enduring 45 minutes despite barbiturate coma. Poststimulation, the patient has been free of seizures for 19 days and is presently taking only levetiracetam and phenobarbital, from which he continues to be successfully weaned without seizures. He is awake, alert, and can recall events leading up to his seizures, with good long-term memory and residual left upper extremity and lower extremity weakness.

This case illustrates the role of left vagal stimulation in the treatment of SE and otherwise medically intractable seizures caused by allergic reactions. To our knowledge, this is the first case in the world

literature for adults reporting cessation of SE after VNS. Another case with a similar improvement has been reported in the pediatric population [9].

A 13-year-old boy was halted by left vagal nerve stimulation. Over the next 1.5 years, seizures have continued at a rate and severity which is significantly better than it had been in the year before insertion of the stimulator [10].

Unclassified

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