Surgical revision of vagus nerve stimulation electrodes

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Introduction
Vagus nerve stimulation (VNS) is an adjunctive therapy for medically intractable epilepsy. With increasing use of VNS, there are more frequent cases of revision for device failure. We report results from our series of patients who underwent re-implantation of VNS devices after removal of old electrodes and leads.

Discussion
VNS has become an important adjunctive approach to medically refractive epilepsy and depression. The increased use of the device necessitates the occasional removal or replacement of electrodes. Although the generator device may be easily removed, there are concerns about whether the removal of electrodes would cause injury to the vagus nerve as there is fibrosis of the area surrounding the electrodes and their leads. A commonly used option is to cut off the distal leads and not remove the electrodes from the vagus nerve. However, there are situations in which complete removal of electrodes is desired. Our series suggests that revision of vagal nerve implants is safe and electrodes can be removed from the vagus nerve. There were no complications associated with the procedure in our series. The efficacy of the new implant is the same as the first and revision does not affect the working of new implant. As the experience of the surgeon increases, the time for revision surgery decreases.

Results

- Age of patients: 11±4 years; M:F ratio: 9:13
- Duration of electrode implantation: 30±17 months
- Indications for revision:
  - non-functioning implant due to high lead impedance: n=13
  - fractured lead wire: n=7
  - Surgical site infection: n=3 (primary surgery at outside institution)
- FU period: 12±15 months.
- Duration of revision surgery: 2.3±0.9 hours
- A trend towards↓operative time as the experience↑(r= -0.37, p=0.1)
- No correlation b/w duration of surgery & duration of old implant
- Complications:
  - No clinically significant peri-operative or post-operative complications
  - No adverse physiologic effects related to vagus nerve manipulation.
- Outcomes:
  - normal device function & lead resistance: 100%
  - Return to prior stimulation response with better seizure control: 100%

Methods
This is a retrospective review of patients who underwent revision of VNS devices between 2000 & 2008 at a tertiary pediatric hospital. A total of twenty three patients were identified during this period that either required complete removal of a device followed by re-implantation of a new device at the same time, or had an old device removed in the past and now required re-implantation. All patients who underwent re-implantation of a device during this period were included in the review.

Conclusion
VNS therapy is reversible and electrodes can be safely removed and replaced once it is considered ineffective or leads are not working.