



## Experience with a Low Single Cervical Incision for Implantation of a Vagus Nerve Stimulator: Technique and Advantages

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■ **OBJECTIVE:** This report describes the technique for implanting a vagus nerve stimulator via a single low anterior cervical incision and discusses the advantages of this technique over that of the more commonly used 2-incision technique.

■ **METHODS:** The authors performed a retrospective review of all patients who underwent implantation of a vagus nerve stimulator by the senior author over a 10-year period.

■ **RESULTS:** One hundred thirty-one patients underwent implantation of vagus nerve stimulators via the single-incision technique. There were no instances of vagus nerve injury, postoperative hematoma, or wound infection, and cosmesis was excellent.

■ **CONCLUSION:** The single-incision technique described here for implantation of vagus nerve stimulators is technically straightforward and safe, and has significant advantages over the 2-incision technique.

### INTRODUCTION

Vagus nerve stimulation (VNS) is becoming more popular in the treatment of epilepsy in patients of all ages (1, 3, 5, 6, 13) and there is increasing interest in its efficacy in managing other disorders such as depression and intractable hiccups (7, 10). The implantation of a vagus stimulator is a less invasive surgical procedure than other surgeries done for epilepsy and has a lower incidence of associated complications, particularly the most serious ones (4). The number of surgeries that involve vagus nerve stimulators is increasing each year, not only for new

implantations, but also because all patients in whom VNS has proven to be beneficial require surgical replacement of their generators as their batteries become depleted.

This trend has resulted in an increasing number of neurosurgeons and other surgical subspecialists, most of whom do only occasional implantations, adapting incisions and approaches familiar to them from other experiences. All implantations of vagus nerve stimulators require an anterior cervical incision, commonly in the left anterior midcervical region, to attach the stimulator lead to the vagus nerve, and most surgeons make a second incision transversely below the clavicle or obliquely near the anterior axillary line for placement of the generator (9). Reported surgical complications of implantation include asystole, wound infection, vocal cord paresis, lower facial weakness, hoarseness, cough, throat pain, dysphagia paresthesias, and dyspnea (2, 4, 10, 11). Cosmetic concerns are rarely, if ever, addressed in publications or considered to be complications.

The authors describe a surgical technique for implanting a vagus nerve stimulator through a low single cervical incision and discuss its simplicity and advantages.

### METHODS

All patients who underwent new implantations of vagus nerve stimulators by the senior author between 1 December 2005 and 1 January 2015 are the basis of this report. Data were collected from existing medical records. The study was done with approval from the Colorado Multi-institutional Review Board.

The technique is illustrated in **Figure 1**.

### Positioning and Skin Incision

The patient, under general anesthesia in the supine position and with muscle relaxation, is positioned with a transverse roll beneath the shoulders and head rotated approximately 15° to the

### Key words

- Epilepsy surgery
- Implantation vagus nerve stimulator
- Single incision
- Vagus nerve stimulator

### Abbreviations and Acronyms

**VNS:** Vagus nerve stimulation

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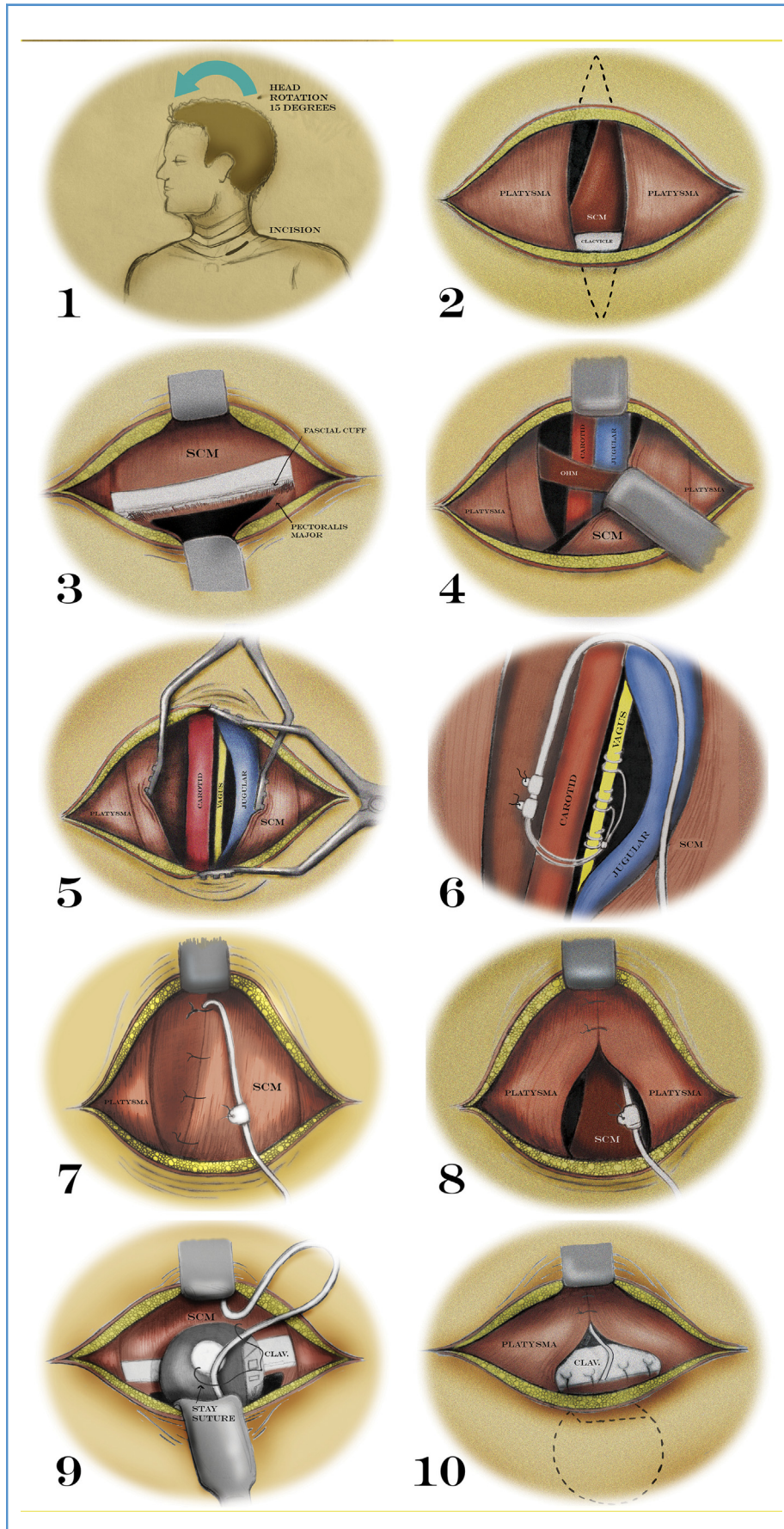
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