Approach for tunneling the lead in deep brain stimulation

Technical note

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The implantation of a deep brain stimulator (DBS) is often a staged procedure that involves stereotactic placement of the neurostimulator electrode, followed by connection of the electrode to a pulse generator during a separate operation. The authors describe a practical technique for the retrograde tunneling of the stimulator lead during the initial electrode implantation procedure. After DBS electrode placement and securing of the lead, the lead is covered with a protective cap and boot, which are then folded back to tunnel a redundant loop of the lead in a retrograde fashion into a subgaleal pocket. This technique facilitates connection of the lead to the pulse generator connecting wire at the subsequent operation and may reduce lead damage. (DOI: 10.3171/2009.6.JNS09554)

Key Words • deep brain stimulation • lead tunneling • technique

T he implantation of a DBS is often a staged procedure, with placement of the neurostimulator electrode followed by connection of the stimulator lead to a pulse generator during a separate operation. In the initial procedure, the DBS electrode is stereotactically placed within the brain, and the lead is secured as it exits the skull. The lead is then capped with a plastic protective cap and boot and tunneled into a subgaleal pocket at the ipsilateral parietal boss. Traditionally, the capped end of the lead is delivered in an anterograde fashion to a temporary location within the subgaleal pocket, with the uncapped portion of the lead remaining in a proximal position (Fig. 1A and B). At the subsequent operation, when the wire connecting the stimulator lead to the pulse generator is placed, the anterograde orientation of the lead makes it difficult to free a sufficient length of the lead to remove the protective cap and connect it to the pulse generator connecting wire. The authors describe a technique for lead tunneling that attempts to eliminate this obstacle.

Description of Technique

After the DBS electrode has been implanted in the brain and secured as it exits the skull, a plastic protective cap and boot are placed over the distal end of the DBS lead to protect it. A subgaleal pocket is then created around the incision. The protective cap is then gently folded back upon itself so that a redundant loop of DBS lead is created (Fig. 1C). The lead and boot are then tunneled in a retrograde fashion to the ipsilateral parietal

Abbreviation used in this paper: DBS = deep brain stimulator.
boss, maintaining this orientation. This maneuver results in a loop of exposed lead (outside of the protective cap) in the most inferolateral position at the completion of the procedure (Fig. 1D). The remaining proximal portion of the electrode is then coiled in the subgaleal pocket with a smooth contour and no tension on the electrode.

Bilateral pulse generators are typically implanted at a later date during a single session of general anesthesia. For each side, an incision is placed at the parietal boss at the inferior aspect of the previously placed protective cap, which can be palpated under the skin. A second incision is made in the chest where the pulse generator pocket is created and from which the pulse generator wire is tunneled to the parietal incision. Once the inferior portion of the protective cap is exposed, the redundant lead allows the boot to be “folded out” into the incision (Fig. 1D). This facilitates the removal of the protective cap and boot and their connection to the pulse generator wire. The redundant DBS electrode lead wire obviates the need to pull on the lead proximally to increase exposure.

**Conclusions**

This report describes a simple technique for the tunneling of a DBS electrode lead. A damaged lead results in additional surgery for a patient as well as the significant financial cost of lead replacement. The technique described is easy to use and may reduce the potential for damage to the lead by limiting the need to pull on the lead or to carry out further proximal dissection while attaching it to the connecting wire.

**Disclaimer**

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

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**Reference**