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Revision of a Superficially Migrated Percutaneous Occipital Nerve Stimulator Electrode Using a Minimally Invasive Technique

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ABSTRACT

Objective. Percutaneous techniques for occipital nerve stimulation have been in the literature since 1999. Lead migration continues to be the most common complication to the technique. The authors would like to introduce a new technique for revision of a superficially migrated occipital nerve stimulator electrode. **Materials and Methods.** Technical report of initial case where revision was performed. **Results.** The patient had successful revision of his superficially migrated occipital nerve stimulator using a new percutaneous approach. He had no signs of infection and full return of prior function of the stimulator at two weeks and three-month follow-up visits. **Conclusion.** This case demonstrates a new safer technique for revision of a superficially migrated occipital nerve stimulator lead. The technique is a more direct and simple solution to a common problem in the percutaneous placement of occipital nerve stimulators.

KEY WORDS: *Cervicogenic headaches, lead migration, occipital nerve stimulation, occipital neuralgia.*

Introduction

Electrical stimulation of nerves for pain control was first introduced by Shealy in 1967 (1). This was shortly after the development of the gate theory by Melzak and Wall in 1965 (2). This technology was first directed at the spinal cord, but soon applied to peripheral nerves. The first report of a percutaneous technique for the control of occipital neuralgia was introduced by Weiner et al. (3). Since then neurostimulation has been a commonly applied modality for patients with chronic headaches refractory to more conservative measures.

The percutaneous technique described by Weiner is not without complications. The most common of which is lead migration. In 2007, Schwedt described 60% of his patients requiring a revision of their lead secondary to migration (4). When compiling data from 15 studies from 1997 to 2007 out of 161 total leads implanted with the percutaneous technique a total of 30 leads migrated (5). This equals a rate of approximately 19%. Slavin et al. reported one case of skin erosion around the electrode tip which was managed by removing the entire electrode and reimplanting it one month later (6). In a recent comprehensive review on spinal cord stimulator complications by Turner et al., 23% of spinal cord stimulator implants required revision (7).

Currently for occipital stimulator leads, there are three intuitive approaches to manage a migrated lead. The first involves removing the migrated lead completely and then replacing it with a new lead. The second entails dissecting out the migrated lead, burying it, and then suturing the overlaying skin. Gofeld in 2004 introduced a third technique which involves making an incision over the original anchor site and removing the distal portion of the lead (8). He then made a second incision on the opposite side of the

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occiput and advanced a 15-G needle to the first incision site. He fed the lead retrograde through the needle and sutured the distal end of the occipital lead to prevent movement.

We would like to introduce another option which is less invasive to revise a superficially migrated occipital nerve stimulator electrode. Our technique is similar to Gofeld's, but requires less incisions and no distal suturing. The previously mentioned techniques are both invasive and carry along with them the risks of bleeding, infection and damage to the electrode. They also involve a longer procedure time and increased cost with the use of new equipment and longer operating room time. We found this technique to be much simpler and safer to the patient when compared with the two previous methods.

Case Presentation

Percutaneous bilateral occipital nerve stimulators were placed in a 45-year-old man for the management of cervicogenic headaches. The stimulator had been in place for approximately one year with excellent results. The lead was placed using the percutaneous technique referenced above. The patient presented to the office with a chief complaint of a burning pain in the area of his occipital nerve electrode. This pain was only present with the simulator on and, subsequently, the patient had stopped using the right-sided occipital stimulator. Upon further examination, it was noted that the lead had migrated superficially under the subcutaneous tissue when compared with the left-sided lead. (Fig. 1) The type of migration or displacement we are discussing in this case is superficially toward the skin surface. This is also commonly referred to as a decubitus or electrode erosion. When comparing the initial fluoroscopic images from a year ago with a current image, there was no migration of the lead toward the proximal anchor site, which is a different type of migration. We speculated that the burning sensation was from stimulation of the superficial scar tissue. The skin around the right occiput region also was thoroughly inspected and there were no sings of infection. The patient was scheduled for a revision of the migrated scalp electrode.

Procedural Technique

The patient was brought to the operating room after obtaining full consent. The hair around the right subclavian area was clipped over the sight of the right occipital lead generator. This was in preparation that the entire lead and generator would potentially have to be changed if there was any damage to the existing lead. The patient was then placed in the prone position and his occiput was clipped then prepped and draped in a sterile fashion. The patient was given intravenous sedation. Fluoroscopy was used to identify the position of the right occipital lead. (Fig. 2) The skin overlaying the proximal side of the lead was infiltrated with 2% lidocaine with epinephrine. The epinephrine was added to promote vasoconstriction and minimize bleeding. A standard bovie is not recommended because it could very easily damage the lead. A 1.5–2.0 cm "V" shaped incision was made over the midline portion of the lead close to where the proximal anchor was located thus creating a flap. The depth of the flap was down to the dermal layer with care not to cut into the lead. The lead was then exposed by blunt dissection using a mosquito forceps and fluoroscopic guidance. Once the midline portion of the lead was exposed, the distal portion was pulled back

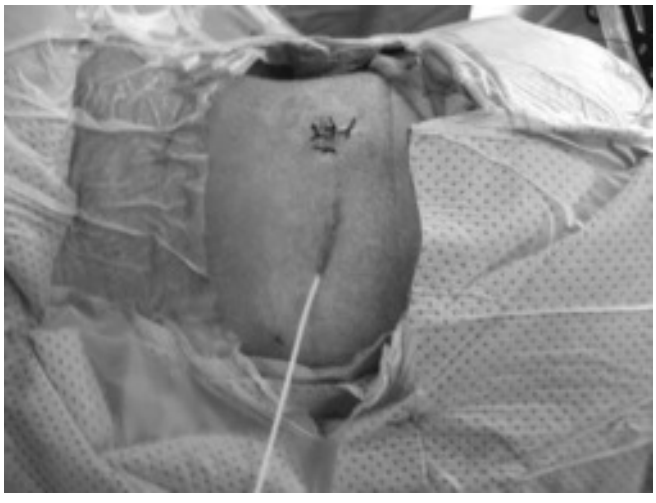

FIGURE 1. Superficial erosion of occipital lead (shown at tip of white pointer).

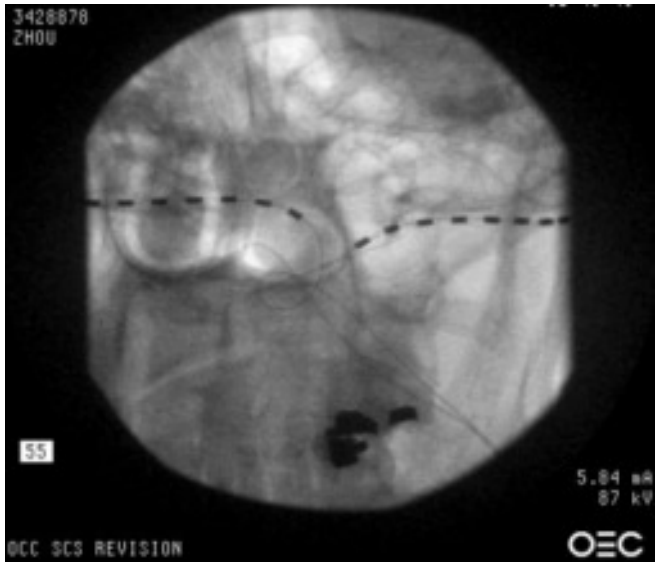

FIGURE 2. Initial fluoroscopic image.

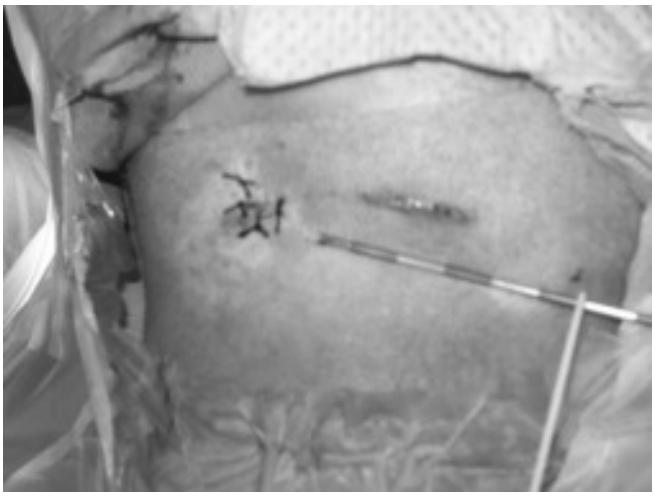

FIGURE 3. Demonstration of new placement of lead 1 cm below previous lead site. White pointer demonstrating lateral puncture site of Touhy needle directed toward V incision (seen with silk sutures).

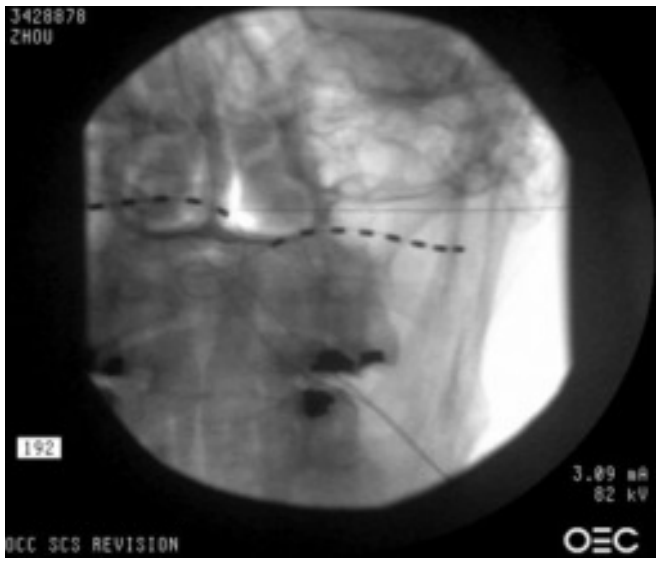

FIGURE 4. Fluoroscopic image after lead revision with original lead placement marked by thin needle 1 cm above new lead position.

proximally to the "V" shaped incision. The integrity of the lead was then thoroughly inspected for any obvious damage.

Obvious damage to the lead would require replacement of the lead. In our case, the lead exhibited no gross damage. The repositioning of the lead was to be 1 cm below and parallel to the previous tract of the right-sided lead. (Fig. 3) The lead was now measured to approximate its most lateral position on this repositioned tract. A mark was made using a sterile marking pen 2 cm lateral to this lateral most point along the occiput. A 15-gauge Touhy needle was then bent concave toward the bevel to approximate the curvature of the occiput. It was then inserted, subcutaneously, from the lateral mark medially toward the midline of the occiput. The bevel of the needle was positioned deep to ensure that the end of the lead would be buried deeper in the subcutaneous tissue and not in a superficial direction. This helps to ensure that the lead will not migrate superficially. The needle was advanced in a lateral to medial direction until it was visualized through the "V" shaped incision. Care must be taken to assure that the lead is not damaged by the sharp end of the Touhy needle. The stylet was then removed from the hollow Touhy needle. The dissected lead was carefully threaded through the epidural needle in a medial to lateral direction. The Touhy needle was then slowly removed in a medial to lateral direction. The removal of the needle buried the lead in the parallel plane approximately 2 cm below the old tract and the lead buried in the subcutaneous tissue.

Fluoroscopy was used to confirm position of the electrode and comparison was made to previous fluoroscopic pictures taken at the beginning of the case. (Fig. 4) The

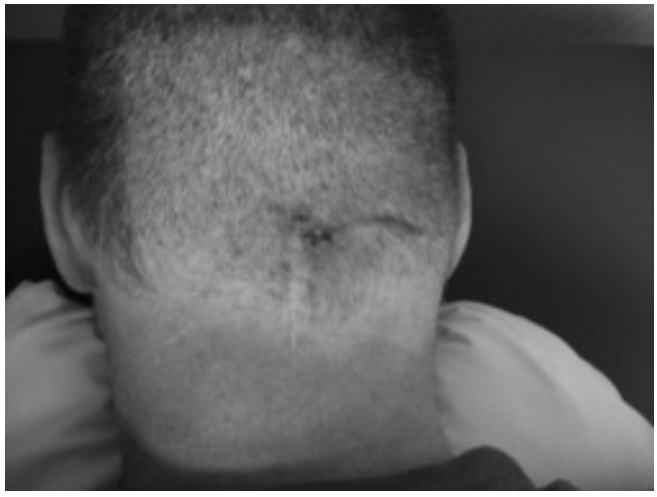

FIGURE 5. Ten-day follow-up in clinic after suture removal.

stimulator was then tested and confirmed by the patient to be in satisfactory working condition. The incision was closed using 3-0 silk sutures and covered with a sterile dressing. The entire procedure took about 15–20 minutes. The patient was transported to recovery and discharged shortly from the hospital. The patient was sent home with a prescription for an antibiotic for prophylactic purposes. The patient was seen in the office ten days and six months after the procedure with no complications and no signs of infection around the surgical site. (Fig. 5) His previous pain with use of the right-sided occipital stimulator was

completely resolved. He was able to return to his previous level of pain relief before the stimulator lead had migrated.

Conclusion

Lead migration is a common complication with the placement of subcutaneous occipital stimulators. The above technique is a more direct and simple solution to a common problem of superficial lead migration in occipital nerve stimulators. The above technique carries less risk of infection and bleeding along with lower costs and decreased operating room time. The procedure causes less trauma to the patient and quicker recovery time. We have since used this technique in two additional patients with similar excellent results.

Conflict of Interest

The authors have not reported any conflicts of interest.

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