Article published online: 2022-09-14

Case Report

Is Transposition of Deep Brain Stimulation Device a Solution in Patients with Recurrent Skin Erosions?

Abstract

Skin erosion and infection are common but serious problems in deep brain stimulation (DBS). They can lead to the removal of the entire DBS device and consequently stop the entire treatment. Of critical importance, therefore, is to find surgical solutions that allow to leave the complex DBS device in place when medical treatment fails in repeated skin complications, to allow continuing treatment in otherwise pharmacological refractory patients. We present a patient with repeated retro-auricular skin erosions, who failed to respond to surgical revisions and antibiotic treatment. However, instead of removing the DBS device as it would be general practice we succeeded with a right to left transposition of connecting cables to save the entire DBS system. There is lack of data on therapeutic surgical options in repeated skin complications. We propose the transposition of DBS device as possible solution for multiple skin erosions in DBS surgery.

Keywords: *Complications, deep brain stimulation, Parkinson's disease, tunneling*

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Background and Importance

Since its Renaissance in 1987, deep brain stimulation (DBS) has become an effective treatment for pharmacological refractory movement disorders.[1,2] During the last decades, the indications for DBS expanded rapidly with the application of DBS for refractory psychiatric disorders[3,4] to advanced cognitive disorders.[5] However, DBS, as any surgical intervention, is associated with potential complications; these are divided in surgical, hardware, and stimulation-related adverse effects. Skin erosions and infection constitute hardware-related (HWR) complications with a reported complication rate of circa 25%.[6] HWR complications may need surgical revision/medical treatment and if these fail the removal of the entire DBS system. In this paper, we present a case of recurrent skin erosions at the retro-auricular area and lateral cervical level that initially was unsuccessfully treated with surgical revisions. To avoid having to remove the entire DBS device, we performed finally a right-to-left connecting cable and internal pulse generator (IPG) (Activa PC Medtronic, Minneapolis, MN, USA) transposition, which proved to be successful.

Case Report

A 47-year-old male patient underwent DBS of the subthalamic nucleus (STN) for Parkinson's disease. The surgical procedure of lead placement (Medtronic Minneapolis, MN, USA) was uneventful. Two days later, the second phase of DBS surgery related to the subcutaneous tunneling of DBS extension wires was performed. Tunneling can be a one-step[7] or a two-steps procedure.[8] At our department, tunneling is performed in a single passage without retroauricular region incision. STN DBS led to a remission of the tremor. Three months after the surgical procedure, a cutaneous erosion appeared in the right retro-auricular region with exposition of the connecting cable that required a surgical correction; we performed an excision of the borders of the cutaneous erosion, a vigorous washing of the operating region with physiologic solution, oxygenated water under antibiotic coverage. The connecting cables at the level of erosion were repositioned deeper sutured above the muscular fascia. An antibiotic therapy with Ceftriaxone (Rocephin®) for 8 days was installed. This treatment approach was successful. Three months after the surgical revision, the patient had a further skin erosion at a lower level at the right lateral cervical region. A second surgical

How to cite this article: Servello D, Saleh C, Zekaj E. Is transposition of deep brain stimulation device a solution in patients with recurrent skin erosions?. Asian J Neurosurg 2018;13:1252-3.

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Access this article online

Website: www.asianjns.org

DOI: 10.4103/ajns.AJNS_184_17

Quick Response Code:

revision (using the same method as for the first one) was necessary. The surgical procedure was uneventful, and the skin had a good healing. Four months after the second surgical procedure, the second skin erosion occurred in the lateral cervical region. Given this repeated and by now third skin erosion along the path of the connecting cables, we restrained from repeating a surgical revision procedure as applied for the first two skin erosions. We considered and informed the patients of two therapeutic options, which consisted in the total removal of the entire DBS system or attempting a left transposition of connecting cables without touching the DBS electrodes. The patient agreed with the proposed surgical procedure of left transposition of the connecting cables and IPG (Activa PC Medtronic, Minneapolis, MN, USA). Under general anesthesia, the IPG located in the sub-clavicular space was removed. A linear skin incision was made at the right retro-auricular space at the level of the connecting cables. Using a Peak Plasma blade, the distal part of the DBS electrodes and the connecting cables were exposed, and the connecting cables removed. A subgaleal and subcutaneous tunneling was done from the left subclavicular region to the right retro-auricular area staying posterior to the DBS electrodes. In the subclavicular region, a subfascial IPG pouch was created. The connecting cables were linked proximally to the DBS electrodes and distally to the IPG. A deep and large space was created in the right retro-auricular area to contain the connecting part of the DBS system. The wounds were closed in a multilayer fashion. The wounds healed without any complication.

Discussion

To the best of our knowledge, this is the first report of the right to the left transposition of connecting cables to save the entire DBS system. The aim of our report was to describe a possible solution for multiple skin erosions that fail to respond to surgical revision and medical treatment. After decades of DBS experience, we know that skin erosion management in DBS surgery is one of the most bothersome. To avoid this complication, in recent years, we have developed several surgical techniques, such as a double floor burr hole at the cranial cap level, a single passage of connecting cables tunneling by avoiding retro-auricular incision and submuscular IPG pouch positioning. In this case, we attempted as last therapeutic resort a transposition of connecting cables to save the DBS system, to guarantee the therapeutic benefits of DBS.

Conclusion

Skin complications are a frequent and serious complication of DBS surgery. They can lead to the removal of the entire system, halting the therapy in otherwise pharmacological refractory patients. The publication of surgical solutions in DBS skin complications is of critical importance. This will allow to discuss the different options to arrive to a consensus as to the most efficient application.

Continuous improvement of the DBS device, foremost the use of nanotechnology in surgery[9] and of the surgical procedure are of critical importance to reduce the high incidence of skin erosions.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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