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Epilepsy Intractable Electrodes

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Abstract

A useful but underutilised tool in the preoperative assessment of refractory epilepsy is epidural electrodes. In recent years, we have shifted to using cylindrical epidural 1-contact electrodes (1-CE) rather than Peg electrodes. Because explanations can be given at the patient's bedside, 1-CEs are more flexible. Here, we discuss our 1-CE experience and the associated technical information. This retrospective study comprised 56 patients with intractable epilepsy who underwent epidural electrode insertion for presurgical assessment at the Department of Neurosurgery at Charité University Hospital between September 2011 and July 2021.

Keywords: Electrodes • Surgery • Epilepsy

Introduction

Patients were a median age of 36.3 years (range: 18-87), with 30 (53.6%) female and 26 (46.4%) male patients. 507 electrodes in total, including 93 Fo electrodes, 33 depth electrodes, and 381 epidural electrodes, were implanted with a total operation time of 100.5 38 minutes and an average electrode implantation time of 11.8 5 minutes. There were a total of 24 issues in 21 patients, 11 of which required revision surgery (8 Fo electrode dislocations, 6 CSF leaks, 6 epidural electrode dislocations or malfunction, 3 wound infections, and 2 haemorrhages). The relative electrode complication rate for Peg electrodes was 3/222 (1.4%) and for 1-CE, it was 3/159 (1.9%). Technically feasible, 1-CE epidural recording has a low risk of complications, and it can successfully replace Peg electrodes.

Literature Review

In this article, we discuss the technical challenges of this approach and our experience with epidural electrodes in the context of preoperative monitoring for epilepsy surgery. In recent years, we've transitioned from inserting epidural electrodes with Peg electrodes to 1-CE electrodes. This occurred as a result of the production company's inability to prolong the approval for the Peg electrodes after it had expired. These circumstances prompted us to modify the operation utilising 1-CEs, and we found that the new method allowed for easier management, such as bedside removal without the need for additional general anaesthesia or reopening the incision.

Neurological conditions are a major cause of morbidity and mortality around the globe. The societal burden of these diseases, for which there are now no effective therapy alternatives, has increased due to the rising prevalence of neurological disorders, which is connected to an ageing population. Therefore, it is crucial to find and create novel therapeutic approaches that can stop or reverse neuronal loss by focusing on the fundamental causes of neurodegeneration and neuronal cell death. It has been researched whether there are any safe, naturally occurring neuroprotective secondary metabolites in plants or other natural items. The secondary metabolites and asarone can be found in high concentrations in the rhizomes of the medicinal plant Acorus calamus (L.) and asarone have antioxidant, anti-inflammatory, anti-apoptotic, anticancer, and neuroprotective properties among their pharmacological activities. In order to better understand the therapeutic potential of and asarone in the treatment of neurological illnesses, particularly neurodegenerative diseases like Alzheimer's disease (AD), Parkinson's disease (PD), cerebral ischemia disease, and epilepsy, this paper will provide an overview of recent research in this area. Current studies suggest that and asarone protect neurons by lowering oxidative stress, abnormal protein accumulation, neuroinflammation, neurotrophic factor deficiency, enhancing neuronal cell survival, and activating various neuroprotective signalling pathways. Despite the fact that and asarone has been shown to have advantageous effects in *in vitro* and *in vivo* animal studies, more study is required to convert laboratory discoveries into secure and efficient treatments for patients with Alzheimer's disease, Parkinson's disease, and other neurological and neurodegenerative diseases.

The dura's integrity is preserved during epidural electrode implantation as opposed to other treatments like subdural or depth electrodes. Iatrogenic CSF leaks may occur, but in our research population they did not necessitate surgical intervention. Without requiring a craniotomy or a separate procedure to remove them, epidural electrodes allow for the relatively rapid implantation of bilateral electrodes. The 1-CE's diameter is significantly smaller than that of Peg electrodes, enabling more flexible handling [1-5].

Discussion and Conclusion

Our findings showed that epidural electrodes had a low complication rate of 6/381 (1.6%) in comparison to the problem rates in Fo and depth electrodes 8/93 (8.6%) and 2/33 (6.1%). The relative complication rates of the two epidural electrode designs were comparable, with 3/222 (1.4%) Peg dislocations, 1/159 (1.3%) 1-CE dislocations, and 1/159 (0.6%) 1-CE dislocations. We create a "notch" in which the electrode tip is placed after the burr hole is made with a small Kerrison punch, such as a 2 mm Kerrison punch, to prevent dislocation in the 1-CE. After inserting the 1-CE, the burr hole is filled with bone wax or gelita sponge to guarantee that the electrode stays in its designated location.

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