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Prospective Evaluation of T2-weighted Peri-electrode Hyperintensity in 102 Subjects Undergoing Deep Brain Stimulation

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Introduction

Deep Brain Stimulation (DBS) is a safe and commonly performed procedure. Postoperative T2-weighted peri-electrode hyperintensity (T2PH) on MRI has been described in patients presenting with profound and often delayed symptoms [1, 2]. This process remains poorly understood. Our objective was to perform a prospective evaluation of patients undergoing DBS (1) to determine the rate, and (2) identify risk factors for T2PH.

Methods

Subjects underwent stereotactic DBS electrode placement with either 1 or 2 leads by a single physician. Post-operative MRIs were performed prospectively in all asymptomatic subjects and analyzed for presence of T2PH, defined as T2-weighted signal greater than twice the diameter of the lead. Additionally, MRIs were performed on symptomatic subjects at the time of presentation. Data regarding index disease, preoperative medical issues, operative technique, and intraoperative variables were collected and statistically analyzed.

Results

A total of 191 leads were placed in 102 subjects; 15 (14.7%) subjects demonstrated T2PH. 7 of these subjects presented with symptoms related to the T2PH, most often altered mental status or neurological deficit. Many of the MRI findings were profound, sometimes several centimeters in diameter. No significant statistical difference was found between T2-positive and normal subjects when analyzing multiple variables including: presence of vascular disease, hypertension, anticoagulant/antiplatelet use, “awake” versus “asleep” electrode placement, electrode target, index disease, unilateral versus bilateral lead placement, number of brain penetrations, and presence or absence of microelectrode recording.

Conclusions

Our study equals the largest collection of subjects with this unusual finding and contains the most detailed, comprehensive analysis of perioperative and clinical variables. Postoperative T2PH can present with severe symptoms, and may be more common than previously reported. No clear risk factors have been identified; therefore further studies and increased clinical vigilance will be paramount for improved comprehension and possible prevention of this process.

Learning Objectives

By the conclusion of this session, participants should be able to:
1) Recognize the finding of T2-weighted peri-electrode hyperintensity after DBS.
2) Discuss the frequency of T2PH after DBS and the risk factor findings of this prospective evaluation.

References

1. Ryu SI, Romanelli P, Heit G. Asymptomatic transient MRI signal changes after unilateral deep brain stimulation electrode implantation for movement disorder. Stereotact Funct Neurosurg. 2004;82:(2-3)65-9.

2. Deogaonkar M, Nazzaro JM, Machado A, Rezai A. Transient, symptomatic, post-operative, non-infectious hypodensity around the deep brain stimulation (DBS) electrode. J Clin Neurosci. 2011;18:(7)910-5.

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