P-27

Integration of Five Electrophysiological Test Results for Predicting Outcome of Patients with Bell's Palsy

Jong Ha Lee M.D., Dong Hwan Yun M.D., Jinmann Chon M.D., Yunsoo Soh M.D., Ga Yang Shim M.D., Myung Chul Yoo M.D.

Department of Physical Medicine and Rehabilitation, College of Medicine, Kyung Hee University

INTRODUCTION

Clinical examinations, clinician-based grading scales, and electrophysiological tests can be utilized to predict recovery and guide the management of these patients. The five major electrophysiological tests are needle electromyography (nEMG), electroneurography (ENoG), compound muscle action potential (CMAP), blink reflex (BR), and the nerve excitability test (NET). Although many previous studies have examined the prognostic value of these tests, these studies have primarily focused on the predictive power individual tests. Our study highlights the potential benefit of integrating multiple tests for a comprehensive assessment. It aims to determine whether integrating results from the five electrophysiological tests can enhance the prediction of Bell's palsy outcomes and identify the optimal combination of test results.

METHODS

This retrospective study analyzed 193 patients who were diagnosed with Bell's palsy at our Department of Physical Medicine & Rehabilitation, from January 2020 to December 2022. Clinical data, including House-Brackmann (H-B) grade and electrophysiological data from five tests, were analyzed using multiple logistic regression analysis and decision tree analysis to predict outcome at 6 months. The five electrophysiological tests were: electroneurography degeneration index (ENoG DI), CMAP latency, BR, and nEMG.

Multiple logistic regression analysis was performed to evaluate relationships of different variables (age, sex, paralysis side) with initial H-B grade after adjustment for confounding. To determine the cut-off value for distinguishing complete and incomplete recovery of the follow-up H-B grade, receiver operating characteristics (ROC) analysis was used to calculate area under the curve. Decision tree analysis using a classification and regression tree (CART) was also conducted. To reduce bias caused by differences between complete and incomplete recovery, upsampling was applied during the CART analysis.

RESULTS

We performed decision tree analysis to identify the combination of variables (electrophysiological test results and other factors) that best predicted patient outcome (Figure 1). The decision tree model identified five key predictors of recovery: ENoG DI in the orbicularis oculi, initial H-B grade, interference pattern in orbicularis oculi, NET difference, and CMAP latency in the frontalis.

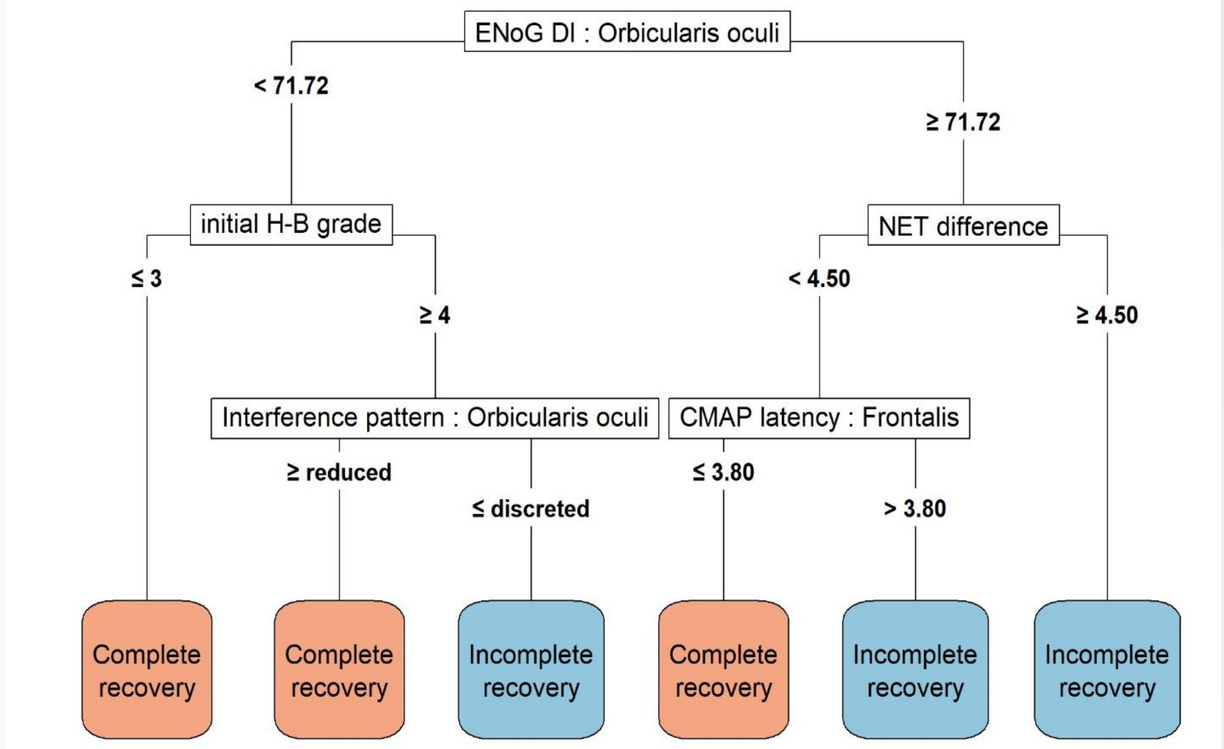

Figure 1. Decision tree algorithm for prediction of outcome (bottom) based on data from the root node (top) and internal nodes (middle). Abbreviations: H-B, House-Brackmann; ENoG DI, electroneurography electroneurography degeneration index; CMAP, compound muscle action potential; NET, nerve excitability test

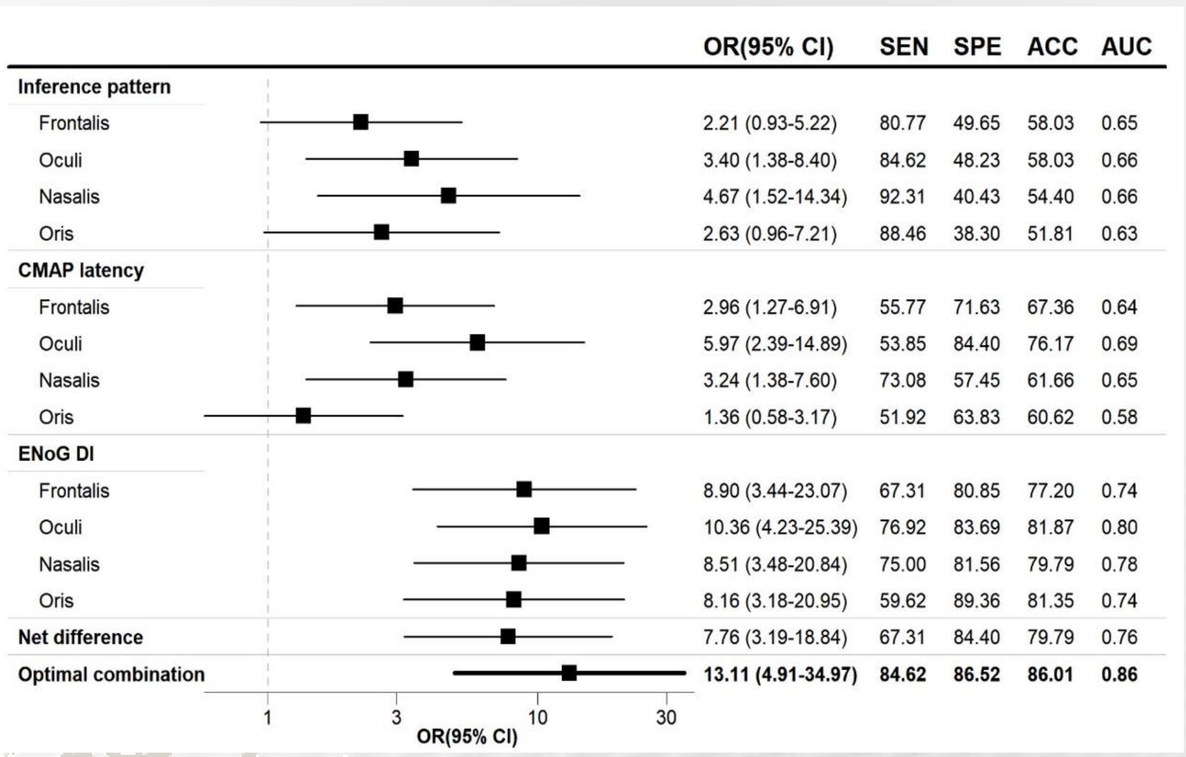

Figure 2. Odds ratios with 95% confidence intervals (CIs) and ROC analysis of electrophysiological data for predicting outcome. OR > 1 favors incomplete recovery (H-B grade 2–6). Abbreviations: SEN, sensitivity; SPE, specificity; ACC, accuracy; AUC, area under the curve; CMAP, compound muscle action potential; ENoG DI, electroneurography electroneurography degeneration index; NET, nerve excitability test.

Patients with an ENoG DI <71.72% and initial H-B grade ≤3 had a high probability of complete recovery. For higher ENoG DI values, a NET difference ≥4.50 mA and CMAP latency >3.80 ms predicted incomplete recovery. This analysis led to an overall accuracy of 86.01%. We then entered the OR values into an ROC analysis for calculation of sensitivity, specificity, accuracy, and AUC (Figure 2). The AUC value of 0.86 suggests that the model is highly reliable for distinguishing between patients likely to experience complete or incomplete recovery.

Thus, this result indicates that the integration of multiple electrophysiological and clinical variables in our model led to robust predictions of 6-month outcome in patients with Bell's palsy

CONCLUSION

This study demonstrated that the combined use of initial H-B grade with the results from multiple electrophysiological results provided reliable outcome predictions in patients with Bell's palsy.

경희의료원 KYUNG HEE UNIVERSITY MEDICAL CENTER

강동경희대학교병원 KYUNG HEE UNIVERSITY HOSPITAL AT GANGDONG