

Bispectral Electroencephalography Effectively Predicts Delirium After Fragility Fracture in Older Adults

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Purpose: Delirium is a common complication after femoral fragility fracture that is strongly associated with medical complications, poor oral nutrition intake, prolonged skilled nursing facility admission, and mortality. Current delirium screening instruments are difficult to implement in busy hospital workflows. Bispectral electroencephalography (BSEEG) is a noninvasive point-of-care test designed to identify older adults at risk of delirium. Identifying high-risk older adults will allow clinicians to provide targeted interventions to mitigate risk of delirium. The purpose of this study is to evaluate the ability of BSEEG to predict delirium in older adults with femoral fragility fractures.

Methods: We prospectively enrolled older adults over 50 years indicated for operative fixation of a low-energy femoral fragility fracture, defined as hip or distal femur fracture. Baseline demographics were collected including age, sex, and Charlson Comorbidity Index (CCI). BSEEG was collected twice daily during hospital admission, for up to 6 days. After each BSEEG recording, delirium was assessed clinically using the 3-Minute Diagnostic Interview for Confusion Assessment Method (3D-CAM) and Delirium Observation Screening Score (DOSS). Baseline cognitive function was evaluated using the Mini-Mental State Examination (MMSE). Power spectral density ratio (PSDR) was used to classify subjects with or without delirium. A prediction threshold chosen in previous clinical trials was used. Descriptive characteristics were compared between delirious and non-delirious participants using t-tests.

Results: 63 participants (67% female), mean age 76.6 ± 9.6 years, were enrolled. The incidence of delirium during hospital admission was 32%. Participants with delirium were more cognitively impaired (19.5 ± 3.7 vs 24.9 ± 3.0 MMSE points, $P < 0.001$). Age, sex, and CCI score did not differ between groups. The performance metrics of BSEEG to detect delirium were: sensitivity, 90%; specificity, 60%; accuracy, 70%; positive predictive value, 51%; and negative predictive value, 93%.

Conclusion: BSEEG effectively predicts delirium in older adults with femoral fragility fracture. BSEEG is a feasible, practical method to objectively measure risk of delirium in this high-risk population. At-risk individuals identified with BSEEG should be provided with interventions to prevent cognitive impairment. Further development is needed prior to implementing BSEEG as a clinical tool in these populations.