Introduction

- Infants with nonsyndromic craniosynostosis (NSC), an early cranial suture fusion syndrome, have similar language acquisition profiles to infants at high risk for autism spectrum disorder (HR-ASD).
- Following surgery for NSC, these patients may or may not recover language development similar to the normal population.
- Auditory event-related potentials (ERPs) measure passive neurological responses to speech sounds, offering a promising method to study infant speech development.
- The mismatch negativity (MMN) quantifies perceptual narrowing and can predict future language development.
- MMN amplitudes in the left central clusters compared to CSO (p=0.008), while MSO demonstrated attenuated left central clusters to TDs (p=0.003).
- Between time points, HR-ASD infants had left frontal MMNs that became more like those of TD and left central MMN that became attenuated compared to TD.
- Between timepoints, MSO infants had no difference in left frontal or central MMNs.
- Between time points, HR-ASD infants with single synostosis (CSO) or across groups of NSC.

Results

- 12 HR-ASD, 5 CSO, 14 SSO, 14 MSO, and 34 age-matched TD infants were included in analyses. Pre-operative average age was 6.46 months for HR-ASD, 7.13 for SSO, 7.61 for SSO, 7.67 for CSO, and 6.66 for TD. The average time between pre and post operative was 218 days.
- While both right and left electrodes were compared, we were primarily interested in left hemisphere areas associated with language.
- MMN amplitudes measured in left frontal clusters were statistically different among cohorts (p=0.043).
- HR-ASD, SSO, and MSO infants produced attenuated left frontal responses compared to TDs (p=0.025, p=0.001, p=0.003, respectively).
- Among NSC cohorts, SSO and MSO infants had attenuated MMN responses in the left frontal clusters compared to CSO (p=0.022, p=0.041, respectively).
- MMN amplitudes in the left central clusters were also significantly different among cohorts (p=0.008).
- SSO and MSO infants demonstrated attenuation in the left central clusters compared to TDs (p=0.015).
- In comparison to HR-ASD, SSO produced attenuated right frontal and central clusters (p=0.031, p=0.008), while MSO demonstrated attenuated right central clusters (p=0.005). There were no differences between CSO infants and TD or HR-ASD infants.

Conclusions

- Results replicate earlier findings that HR-ASD infants respond with lower MMN amplitudes than TD infants.
- In comparison with SSO and MSO infants, HR-ASD infants manifest attenuation neural responses over the left hemisphere, the hemisphere associated with language production.
- Between time points, HR-ASD infants had left frontal MMNs that became more like those of TD and left central MMN that became attenuated compared to TD.
- Between timepoints, MSO infants had no difference in left frontal or central MMNs.
- Between time points, SSO infants had left frontal and central MMNs that became more similar to those of TDs.
- CSO infants did not experience differences pre/post-operatively compared to TDs.
- This study begins to develop the early language profile of HR-ASD infants within the clinical context of different suture fusion craniosynostosis.
- Future efforts will attempt to include more uniconoral patients in analysis.
- Results warrant future studies comparing language acquisition in HR-ASD and NSC.

Citations


This study was supported by NHLBI K23HL066765 (J.W.), Simons Foundation 494024 (J.M.), CTSI Grant Number UL1 RR024139 (L.J.M.), the American Society of Maxillofacial Surgeons (J.P.), the Plastic Surgery Foundation (J.P.), and the Office of Student Research at the Yale School of Medicine (R.W.).