Facial synkinesis is the coupling of unintentional facial movements with those that are intentional, generally involving the periorcular, midface, perioral, chin and neck muscles. Commonly, patients with synkinesis attempt to close their eyes and experience unintentional lip movement or attempt to smile and experience unintentional eye closure. Facial synkinesis develops weeks or months after facial nerve injury, and is most commonly seen after idiopathic facial nerve injury, e.g. Bell’s palsy (BP).

Synkinesis is thought to occur secondary to both aberrant peripheral nerve regeneration and neuronal reorganization in the facial nucleus. Although there are data to support cortical reorganization in patients with BP, there are no such data in synkinesis. Facial synkinesis is the coupling of unintentional facial movements with those that are intentional, generally involving the periorcular, midface, perioral, chin and neck muscles. Commonly, patients with synkinesis attempt to close their eyes and experience unintentional lip movement or attempt to smile and experience unintentional eye closure. Facial synkinesis develops weeks or months after facial nerve injury, and is most commonly seen after idiopathic facial nerve injury, e.g. Bell’s palsy (BP).

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Methods

Functional magnetic resonance imaging (fMRI) was used to characterize changes in the central nervous system (CNS) by studying changes in the motor cortex and sensorimotor integration regions during motor tasks that elicit facial synkinesis. 14 subjects with a history of BP (7 fully recovered (FR), 7 with synkinesis) completed the validated Synkinesis Assessment Questionnaire (SAQ) and Edinburgh inventory forms. Subjects performed a series of facial motor tasks, alternating between blinking, smiling and a baseline rest condition, while undergoing fMRI scans in a 3 Tesla Siemens Prisma scanner.

Results

14 subjects with a history of BP were enrolled. 7 subjects with synkinesis (avg SAQ 73, SD 20; avg age 60, SD 15) and 7 FR subjects (avg SAQ 23, SD 5; avg age 61, SD 12) underwent fMRI scanning. All participants were right-handed. Regions of interest (ROI) were determined for smile and blink conditions [Figure 2].

Question 1: Is there a difference in central activation between the FR and synkinesis subjects?

• Signal during smile and blink conditions is reduced in synkinesis compared to FR subjects [Figure 3].
• Greater signal strength during smile condition along bilateral central sulci and premotor regions seen in FR subjects [Figure 4].
• Reduced signal in central sulcus and premotor cortical regions in synkinesis subjects was seen [Figure 4].

Region activated in the left precentral gyrus corresponds to the area in Figure 3A, where there is substantial activation in FR subjects.

This area has been identified as responsive when healthy subjects perform “lip corner pulling.”

Question 2: Is there a difference in central activation between unaffected and affected sides?

• Synkinesis subjects show greater activation in pre-central gyrus on the affected side relative to the unaffected side (not statistically significant) [Figure 5].

Conclusion

Facial synkinesis is associated with alteration in cortical areas involved in motor preparation and execution. fMRI can provide substantial insight into CNS changes as a consequence of synkinesis. fMRI may be a useful to further understand the therapeutic utility associated with therapies that enhance motor control and sensorimotor integration, after learning and reorganization of the facial nerve, and the potential treatment options for synkinesis after transient peripheral nerve injuries.

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References: