Coexistent blepharospasm and hemifacial spasm: overlapping pathophysiologic mechanism?

E-K Tan, L-L Chan, K-K Koh

Methods
We included 164 consecutive HFS patients in the botulinum toxin clinic and 501 outpatient controls without neurological disorders (for every patient, we examined about three age and sex matched controls). HFS patients who satisfied all the following criteria were diagnosed to have coexistent HFS and BEB: (1) a clinical diagnosis of HFS manifested by involuntary tonic and/or clonic contractions of the muscles innervated by the ipsilateral facial nerve; (2) a clinical diagnosis of BEB characterised by frequent blinking which progressed to sustained tonic contraction of both the orbicularis oculi, and (3) separate occurrence of HFS and BEB episodes. The exclusion criteria were patients with facial tics, dystonia, hemimasticatory spasm, tardive dyskinesia, other forms of facial or oromandibular dystonic movements, and bilateral HFS. Patients were investigated with advanced MRI/A imaging techniques sensitive for neurovascular compression. Controls who satisfied a clinical diagnosis of BEB based on history and examination were determined. χ² test and Student t test were used to compare the categorical and continuous variables between patients and controls.

Results
Of the 665 study subjects, there were 164 HFS patients with mean age of 54.8 (SD 12.1) (range 27–80) years, and (102/164) 62.2% of them were women, and 501 controls without neurological diseases with mean age of 51.4 (SD 14.4) (range 32–90) years, and (306/501) 61.1% were women. Nine (5.5%) of 164 consecutive HFS patients diagnosed in the outpatient clinic had coexistent BEB, significantly higher than the outpatient controls (0/501, 0%) (p<0.0001). The mean age of the nine patients was 61.4 (SD 9.9) (range 51–72), consisting of 88.9% women, and 66.7% had left sided HFS, similar to HFS patients without BEB. Six (66.7%) reported BEB symptoms at a mean of 0.8 years after HFS onset, one before, and onset was undetermined in two patients. Advanced magnetic resonance imaging and angiography revealed neurovascular compression of the ipsilateral side of HFS, without any basal ganglia lesions.

Conclusions
BEB occurred more frequently in HFS patients, suggesting changes in the brainstem blink reflex circuitry could play a modulatory role in certain at-risk individuals resulting in the coexistence of these movement disorders.

ILLUSTRATIVE CASE REPORTS
Patient 8
The patient, a 60 year old woman, complained of twitching in the left lower lid followed by the left lower facial muscles, resulting in eyelid closure and pulling of angle of her mouth upwards. She was diagnosed to have left HFS and treated with botulinum toxin with improvement. Less than a year later, she noticed twitching of her right and left eyelids simultaneously, accompanied by frequent eye blinking and eyelid closure. These movements worsened under bright daylight. This was separate from the episodes of her left sided HFS. MRI/A examination revealed neurovascular compression of the ipsilateral facial nerve by the left posterior inferior...
Coexistent blepharospasm and hemifacial spasm

HFS study sample. Conversely, studies of BEB patients in white populations frequently described coexistent cranio-cerebellar artery. All her symptoms were effectively treated with botulinum toxin.

**Patient 1**

This patient, a 52 year old woman, had mild residual right facial weakness after suffering from a right Bell’s palsy. About two years later, she developed twitching of her right lower eyelid, and two months later, her right lower facial and platysma muscles were also involved. She was diagnosed to have right HFS. An MRI/A examination did not reveal any significant neurovascular compression of the ipsilateral facial nerve. One year after the HFS onset, she started complaining of frequent blinking followed by twitching and spasms of both right and left eyelids. The eyelid contractions were bilaterally synchronous, separate from the episodes of her right HFS. Both HFS and BEB responded to botulinum toxin injections.

**DISCUSSION**

We found a higher prevalence of BEB in a cohort of HFS compared with age and sex matched controls (5.5% v 0%, p<0.0001). The likelihood of selection bias or coincidence of BEB among HFS patients was small because BEB was rarely encountered than HFS in our clinic population (estimated to be around 1:15), and the majority (66.7%) of the nine patients developed BEB after HFS onset. The clinical characteristics of HFS patients with and without BEB did not differ. BEB was not reported to occur in an American white population. Frequently described coexistent cranio-cerebellar artery and essential tremor but not HFS. We do not know whether there are any ethnicity specific differences in these observations, as HFS is relatively rare among whites.

Other differential diagnosis such as bilateral HFS was unlikely, as advanced MRI/A imaging demonstrated neurovascular compression of the ipsilateral facial nerve in the majority of our cases, and there were no structural lesions to account for both HFS and BEB. All the patients had simultaneous onset of their BEB symptoms bilaterally (separate from their ipsilateral HFS symptoms), unlike the long latency of onset between the two sides reported in bilateral HFS. In three patients, family members had noticed the ipsilateral facial spasm but not BEB movements during sleep. Persistent HFS symptoms during sleep are well recognised. Furthermore, patients with cranial dystonic movements such as Meige syndrome and tardive dystonia/dyskinesia were excluded.

BEB and HFS appear to be distinct disorders with differing patho-etiologies. While structural lesions in basal ganglia and other risk factors have been described in BEB, most cases are of unknown aetiology. On the other hand, neurovascular compression of the root exit zone of the ipsilateral facial nerve is the most common cause of HFS. Current evidence suggests that genetic predisposition is more important than environmental factors in BEB. Similarly host susceptibility may also be relevant in some cases of HFS, supported by observations that HFS is much more prevalent in Orientals, neurovascular compression of the facial nerve may not always result in HFS, and HFS can be inherited. It would be interesting to determine whether BEB symptoms in our patients resolve after decompression surgery for HFS.

The trigemino-facial connections responsible for blinking involve afferent and efferent pathways in the pons and medulla oblongata. It is recognised that the blink reflex can be influenced by the cortex and basal ganglia. Activity dependent interaction between hand and face representations in the motor cortex before and after botulinum toxin injections in HFS patients suggest the presence of cortical plasticity in HFS. Impairment of the inhibitory trigemino-facial reflexes in HFS, and also excitatory trigemino-facial responses in the perioral muscles suggest a central control of these reflexes. There was a clinical report of two patients with coexistent movement disorders such as tremor, BEB, and HFS associated with caudate infarcts. These observations suggest that it is possible that altered cortical or subcortical processes in some HFS patients may modulate the blink response, resulting in BEB symptoms.

In a rat model of BEB, reduced inhibition within the trigeminal blink circuits with weakening of the oribcularis oculi muscle triggers spasms of lid closure, similar to BEB in humans. The observation of patients with facial palsy induced BEB suggests altered afferent input from facial weakness could cause an increase in the excitability of reflex blinking. Mild facial asymmetry and weakness is frequently observed in patients with chronic HFS with or without botulinum treatment. It is conceivable that facial weakness predisposed a few at-risk patients to develop BEB symptoms, as most of our study patients developed BEB after botulinum treatment for their HFS. In addition, one patient had Bell’s palsy associated HFS and BEB.

In conclusion, we found a higher than expected prevalence of BEB in HFS patients compared with age and sex matched controls, suggesting that these two conditions may share overlapping pathophysiological mechanisms. Functional electrophysiological and imaging studies will be useful to further examine and clarify this association.

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**Table 1** Patients with coexistent hemifacial spasm and blepharospasm

<table>
<thead>
<tr>
<th>Patient (age, sex)</th>
<th>Hemifacial spasm (duration, side)</th>
<th>Blepharospasm (onset before/after)</th>
<th>MRI/A findings</th>
<th>Associated diseases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 56, female</td>
<td>7 yr, left</td>
<td>1 yr after</td>
<td>Left VA</td>
<td>Hypertension</td>
</tr>
<tr>
<td>2. 52, female</td>
<td>2.5 yrs, right</td>
<td>0.5 yr after</td>
<td>Normal</td>
<td>Left Bell’s palsy</td>
</tr>
<tr>
<td>3. 72, female</td>
<td>2 yrs, left</td>
<td>2 yr before</td>
<td>Left AICA</td>
<td>Diabetes, heart</td>
</tr>
<tr>
<td>4. 76, female</td>
<td>4 yrs, right</td>
<td>1 yr after</td>
<td>Not available</td>
<td>Disease, head tremor</td>
</tr>
<tr>
<td>5. 58, male</td>
<td>1 yr, left</td>
<td>1 yr after</td>
<td>Not available</td>
<td>Hand tremor</td>
</tr>
<tr>
<td>6. 51/Female</td>
<td>2.5yrs, right</td>
<td>Undetermined</td>
<td>Right PICA</td>
<td>Nil</td>
</tr>
<tr>
<td>7. 54, female</td>
<td>1.5yrs, left</td>
<td>0.1 yr after</td>
<td>Left PICA</td>
<td>Past history of thyroid disease</td>
</tr>
<tr>
<td>8. 60, female</td>
<td>6 yrs, left</td>
<td>1 yr after</td>
<td>Right PICA</td>
<td>Hypertension</td>
</tr>
<tr>
<td>9. 75, female</td>
<td>2.5yrs, left</td>
<td>Undetermined</td>
<td>Not available</td>
<td>Nil</td>
</tr>
</tbody>
</table>

VA, vertebral artery; AICA, anterior inferior cerebellar artery; PICA, posterior inferior cerebellar artery; Yr, year.
REFERENCES

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