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Research Paper

# Impact of early eyelid weight placement on the development of synkinesis and recovery in patients with idiopathic facial paralysis

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Facial paralysis;
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**Abstract** *Purpose:* Determine the impact of upper eyelid weight placement at 3 months post onset of idiopathic facial paralysis (IFP) on the recovery of facial function in patients with lagophthalmos.
*Methods:* This is a retrospective review of patients with incomplete recovery of IFP—defined as a Sunnybrook Facial Grading Scale (FGS) score of less than 100, 3 months after onset. Only patients with FGS and Facial Clinimetric Evaluation (FaCE) scores recorded at 3 and 12 months were included. Patients were categorized into 3 groups: Group A, lagophthalmos with eyelid weight placement; Group B, lagophthalmos without eyelid weight placement; Group C, complete eye closure (CEC) without eyelid weight placement. The eye comfort domain and composite score of the FaCE questionnaire were analyzed. Voluntary eye closure, synkinesis with eye closure, overall synkinesis and the composite score of the FGS were also analyzed. Paired two-tailed *t*-test was used to evaluate the data comparing the 3 and 12 month FaCE and FGS scores within and between the 3 groups.
*Results:* The change in composite FGS score significantly increased from month 3 to month 12 in Group A as compared to Group B (37 vs 4.25, $P = 0.01$). While Group A had significantly lower eye comfort (−12.5, $P = 0.01$), voluntary eye closure (−1.75, $P = 0.05$) and overall

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FGS scores (−28.75, P = 0.04) at 3 months compared to those in Group C, there were no differences between these two groups at 12 month follow-up.
*Conclusions:* For patients with lagophthalmos at 3 months, early eyelid weight placement may lead to improved facial function at 12 months.


## Introduction

Acute idiopathic facial paralysis (IFP), also known as Bell's palsy, presents as unilateral weakness or paralysis of the face due to acute dysfunction of the peripheral facial nerve without identifiable cause. This phenomenon often leads to distinct cosmetic and functional consequences contributing to both psychological and physiologic concerns.[1,2] Although the majority of cases resolve spontaneously without treatment, approximately 26% of cases will result in permanent facial nerve dysfunction, ranging from complete paralysis to partial recovery.[3] Given that the incidence of IFP in the U.S. is 23 in 100,000 people, this leaves approximately 18,000 patients per year with non-resolving sequelae of facial dysfunction.[4] Facial nerve dysfunction can result in aberrant regeneration of the facial nerve and motor synkinesis in addition to post-paralytic spasms and resting hypertonia of the facial musculature. Despite the potentially devastating psychosocial and physiologic effects of intractable facial dysfunction, the treatment of acute idiopathic facial palsy has remained stagnant for decades.

Several studies have validated the ability of the Sunnybrook Facial Grading System (FGS) to successfully predict which patients with IFP are at the highest risk for incomplete recovery.[3,5,6] Engstrom et al[3] demonstrated that if there was incomplete recovery at one month, there is only a 60% chance of full recovery. At six months, this chance decreases to 20%. Despite this, there has been no study published to date regarding potential early interventions for patients in whom complete recovery is not expected. Current guidelines for the treatment of idiopathic facial palsy focus on medications to decrease inflammation-mediated neuropraxia and the avoidance of exposure keratopathy.[7] In this study, we attempt to broaden the discussion by assessing the utility of early eyelid weight placement on overall recovery in IFP patients with incomplete recovery 3 months after onset.

## Methods

After obtaining approval from the Georgetown University Medical Center Institutional Review Board, a medical record review using the electronic medical record was conducted of all patients with a diagnosis of idiopathic facial palsy. The Facial Clinimetric Evaluation (FaCE) Scale and Sunnybrook Facial Grading System (FGS) are evaluation tools used to monitor the severity of facial palsy. The FaCE Scale is a patient-graded scale that focuses on the functional aspects and quality of life impact of facial paralysis in these patients.[8] As previously discussed, the Sunnybrook FGS is a physician-graded instruments used to measure the degree of facial muscle impairment and asymmetry.[9] Only patients who provided written consent and completed FaCE and FGS surveys at both 3 months and 12 months after onset of facial palsy were included in this study. FGS surveys were completed by two of the authors (Michael J. Reilly and Jodi Barth) with extensive experience using this instrument. Patients with diagnoses other than acute idiopathic facial palsy leading to facial paralysis (i.e. facial trauma, acoustic neuroma) were excluded from the study.

Of the 96 patients with a diagnosis of idiopathic facial palsy, 11 patients met the criteria for inclusion in this study. These patients were then categorized into 3 groups: Group A, lagophthalmos who then underwent eyelid weight placement ($n = 4$); Group B, lagophthalmos without eyelid weight placement ($n = 4$); Group C, complete eye closure (CEC) without eyelid weight placement ($n = 3$).

Statistical analyses were conducted based on the FaCE and FGS surveys. For the FaCE questionnaire, the eye comfort domain and the composite scores were analyzed. For the FGS questionnaire, the domains of voluntary eye closure, synkinesis with eye closure, overall synkinesis, and overall composite score were analyzed. Paired two-tailed *t*-test was used to evaluate the data comparing the 3 month and 12 month FaCE and FGS scores within and between the 3 groups.

## Results

The four patients in Group A underwent eyelid weight placement (96.3 ± 21.5) days after the onset of IFP. Of note, Group A data at 3 months is taken from prior to the placement of the eyelid weight. Table 1 shows the results of the various domains from the FGS and FaCE questionnaires within each group. Group A demonstrated a statistically significant improvement in eye comfort (+41.67, $P = 0.004$) and voluntary eye closure (+1.75, $P = 0.02$) and overall FGS (+37, $P = 0.05$) at 12 months. Group B notably experienced a significant increase in both synkinesis with eye closure (+3.5, $P = 0.05$) as well as overall synkinesis (+6.25, $P = 0.01$). Group C patients did not demonstrate any significant changes in FaCE or FGS domains.

Comparison of Group A and Group B showed no significant differences at 3 months in the FGS or FaCE domains. Evaluation of these two groups at 12 months revealed a significant increase in the change of the composite FGS score for those in Group A compared to those in Group B (+37 *vs* + 4.25, $P = 0.02$). A trend towards significance was noted for Group A in the

**Table 1** Comparison of FaCE and FGS domains from 3 months to 12 months by Group.

| Group | Domains | 3 month | 12 month | Difference | *P*-value |
|---|---|---|---|---|---|
| Group A | Eye Comfort | 37.5 | 79.17 | +41.67 | 0.004 |
| | Total FaCE | 56.5 | 75 | +18.5 | 0.20 |
| | Voluntary Eye Closure | 3.25 | 5 | +1.75 | 0.02 |
| | Synkinesis with eye closure | 0.25 | 0.5 | +0.25 | 0.52 |
| | Overall Synkinesis | 0.25 | 1.5 | +1.25 | 0.18 |
| | Overall FGS | 32.25 | 69.25 | +37 | 0.05 |
| Group B | Eye Comfort | 45.83 | 68.75 | +22.92 | 0.50 |
| | Total FaCE | 54.43 | 61.5 | +7.07 | 0.31 |
| | Voluntary Eye Closure | 3.75 | 5.25 | +1.5 | 0.28 |
| | Synkinesis with eye closure | 0 | 3.5 | +3.5 | 0.05 |
| | Overall Synkinesis | 0.25 | 6.5 | +6.25 | 0.01 |
| | Overall FGS | 36.65 | 41 | +4.35 | 0.68 |
| Group C | Eye Comfort | 50 | 87.5 | +37.5 | 0.12 |
| | Total FaCE | 63.5 | 72 | +8.5 | 0.20 |
| | Voluntary Eye Closure | 5 | 5 | 0.0 | 1 |
| | Synkinesis with eye closure | 0.33 | 1 | +0.67 | 0.42 |
| | Overall Synkinesis | 2 | 3.33 | +1.33 | 0.61 |
| | Overall FGS | 61 | 76 | +15.5 | 0.31 |

domains of improved eye control, synkinesis with eye closure and overall synkinesis from 3 months to 12 months. There were no differences in the change in scores for voluntary eye closure and synkinesis with closure between the two groups (Table 2).

Comparison of Group A and Group C at 3 months revealed Group A had significantly lower eye comfort ($-12.5$, $P = 0.01$), voluntary eye closure ($-1.75$, $P = 0.05$) and overall FGS scores ($-28.75$, $P = 0.04$) (Table 3). At the 12 month follow-up, there were no differences in the FaCE and FGS domains between these two groups.

Lastly, comparison of Group B and Group C at 3 months revealed Group B had a significantly lower overall FGS score ($-24.35$, $P = 0.05$) (Table 4). At the 12 month follow-up, the overall FGS score remained significantly lower for Group B ($-35$, $P = 0.02$). A trend towards increased overall synkinesis was also noted for Group B at 12 months.

## Discussion

Facial synkinesis is a distressing life-long morbidity to patients with incomplete recovery after IFP. Uncontrolled synkinesis causes significant muscular tension and uncoordinated changes in facial expression in the static and dynamic postures.[10,11] While surgery, selective chemodenervation (onabotulinum toxin-A injection), and physical therapy are all utilized for the management of synkinesis once it has developed, to date there has been no study regarding surgical interventions aimed at the prevention of synkinesis.

In our study, patients with lagophthalmos at 3 months had significantly lower scores in eye control and overall FGS compared to patients with CEC. Interestingly, comparison of the lagophthalmos with eyelid weight placement and the CEC without eyelid placement patients at 12 months revealed no significant differences in any category. In addition, for patients with lagophthalmos, early eyelid weight placement lead to improvement in the change in overall FGS with a strong trend towards decreased ocular synkinesis and overall synkinesis when compared to those

**Table 2** Change in FaCE and FGS domains from 3 to 12 months for Group A vs Group B.

| Domains | Group A | Group B | *P*-value |
|---|---|---|---|
| Eye Comfort | +41.67 | +22.92 | 0.09 |
| Total FaCE | +18.5 | +7.07 | 0.15 |
| Voluntary Eye Closure | +1.75 | +1.5 | 0.69 |
| Synkinesis with Eye Closure | +0.25 | +3.5 | 0.08 |
| Overall Synkinesis | +1.25 | +6.25 | 0.06 |
| Overall FGS | +37 | +4.35 | 0.01 |

**Table 3** FaCE and FGS scores at 3 months and 12 months for Group A *vs* Group C.

| Time | Domains | Group A | Group C | *P*-value |
|---|---|---|---|---|
| 3 month | Eye Comfort | 37.5 | 50 | 0.01 |
| | Total FaCE | 56.5 | 63.5 | 0.34 |
| | Voluntary Eye Closure | 3.25 | 5 | 0.05 |
| | Synkinesis with Eye Closure | 0.25 | 0.33 | 0.79 |
| | Overall Synkinesis | 0.25 | 2 | 0.36 |
| | Overall FGS | 32.25 | 61 | 0.04 |
| 12 month | Eye Comfort | 79.17 | 87.5 | 0.49 |
| | Total FaCE | 75 | 72 | 0.88 |
| | Voluntary Eye Closure | 5 | 5 | 1 |
| | Synkinesis with Eye Closure | 0.5 | 1 | 0.53 |
| | Overall Synkinesis | 1.5 | 3.33 | 0.32 |
| | Overall FGS | 69.25 | 76 | 0.68 |

**Table 4** FaCE and FGS scores at 3 months and 12 months for Group B vs Group C.

| Time | Domains | Group B | Group C | *P*-value |
|---|---|---|---|---|
| 3 month | Eye Comfort | 45.83 | 50 | 0.24 |
| | Total FaCE | 54.43 | 63.5 | 0.30 |
| | Voluntary Eye Closure | 3.75 | 5 | 0.12 |
| | Synkinesis with Eye Closure | 0 | 0.33 | 0.20 |
| | Overall Synkinesis | 0.25 | 2 | 0.35 |
| | Overall FGS | 36.65 | 61 | 0.05 |
| 12 month | Eye Comfort | 68.75 | 87.5 | 0.49 |
| | Total FaCE | 61.5 | 72 | 0.66 |
| | Voluntary Eye Closure | 5.25 | 5 | 0.88 |
| | Synkinesis with Eye Closure | 3.5 | 1 | 0.10 |
| | Overall Synkinesis | 6.5 | 3.33 | 0.06 |
| | Overall FGS | 41 | 76 | 0.02 |

that did not have an eyelid weight. These findings suggest that eyelid loading in patients with lagophthalmos at 3 months post-onset may help to move them to a higher place on the facial nerve recovery curve and may help decrease the risk for developing synkinesis. Although we were unable to identify a specific area of improvement on the FaCE and FGS questionnaires, our results support a global improvement in facial function.

Although an association between lid loading and decreased synkinesis does appear to exist, the causal relationship remains hypothetical as there are currently no studies in the literature assessing the mechanism by which eyelid loading can improve recovery of facial function following idiopathic facial paralysis. However, there are studies that detail the relief of blepharospasm with the use of eyelid loading.[14,15] These studies have shown that eyelid loading passively increases the amplitude of paretic eye closure as well as the degree of closure relative to the normal eye, which ultimately decreases peripheral feedback involvement in the maladaptive control of blinking.[12,16]

Expounding on this theoretical foundation about the use of eyelid loading in the treatment of blepharospasm, we hypothesize that there are likely benefits to overall facial recovery when an eyelid weight is placed in an IFP patient with IEC. In patients with more severe facial paralysis, attempted eye closure requires extensive recruitment of musculature beyond just the orbicularis, which can promote a greater degree of aberrant nerve regeneration.[12,13] The improvement from placement of an eyelid weight in these patients most likely relates to beneficial biofeedback loops that allow for less excessive recruitment of non-orbicularis facial musculature and therefore less synkinesis.

The majority of patients suffering from IFP initially present to an emergency or primary care setting.[17,18] Unfortunately, referral to facial paralysis experts is often delayed until sought out by the patient, which may be a reason for our low number of patients meeting inclusion criteria. This limitation emphasizes the importance of working toward a multidisciplinary approach in the treatment of patients with IFP, ensuring that providers who treat facial palsy and the associated ocular complications are aware of the resources available for those patients. Given our data in conjunction with the previously well-established risk of a lower chance of recovery with a longer duration of illness,[3] we highly recommend early (<3 month) referral to experts for patients with incomplete recovery of IFP. We believe patients with incomplete recovery of IFP should be counseled on the potential risks and benefits of upper eyelid loading early in their course of paralysis, as this intervention may have a long-term benefit to their overall recovery.

## Conclusion

This study emphasizes the importance of early identification of patients with a lower likelihood of recovery from IFP. Our findings suggest that patients with lagophthalmos at 3 months may benefit from an upper eyelid loading procedure to help optimize facial function and potentially decrease the risk of developing synkinesis. Further research is needed to delineate the specific timing and indications for undergoing eyelid loading procedures in patients suffering from this condition.

## Declaration of Competing Interest

None.

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