



# Acknowledgements

- Jackie Diels, OT
- UW Facial Nerve Clinic
- Leslie Wei, MD

Facial Nerve Clinic

#### Overview

- Synkinesis basics
- Case examples
- Treatment strategies
- Recent work on buccinator synkinesis

#### Overview

- Treatment strategies with toxin
- Case examples
  - context of buccinator treatment as part of full facial treatment
- Highlight Rx of buccinator synkinesis

# Synkinesis

Involuntary movement of one mimetic muscle group occurring during the attempted movement of a second muscle group

### Synkinesis

**Common Facial Findings** 

- Dynamic facial asymmetry
  - Eyelid aperture narrowing
  - · Limited oral commissure excursion
  - Smile dysfunction
  - Platysma activation
- Increased resting tone of involved muscles Photo and video credits: Jackie Diels, OT

#### • Deepening of nasolabial fold

# Synkinesis

- Proposed Mechanisms
  - Aberrant regeneration of facial nerve axons
- Peripheral ephaptic (adjacent, non synaptic)
- transmission between axons (ineffective myelination) • Synaptic reorganization and hypersensitivity within the
- facial nerve nucleus
  - Baker RS, et al. Neurology 1994

### Synkinesis

Incidence: 9% - 55%

More proximal lesion --> higher incidence and more severity (primate model) Yamada et al, Laryngoscope 2010

Low response to direct early stimulation  $\rightarrow$  possibly high risk

synkinesis developing in 78% vs 19%

Celik, et al., Eur Neurol 2000

### Synkinesis

#### **Common Patterns**

Oro → Ocular "Pseudoptosis" Marin-Amat variant (eye closure when opening jaw) Oro → Platysmal Oculo → Platysmal Oculo → Oral

### Botulinum for Synkinesis

- Botulinum first reported for synkinesis in 1991
  Roggenkamper P. et al.
- Duration of improvement: 3-6 mo
  - Mean duration: 4 mo
    - Toffola, et al Disability and Rehab, 2010
- Several studies demonstrate synergistic effect of botulinum in combination with rehab / neuromuscular retraining

#### Synkinesis

- Placebo-controlled RCT supporting Botulinum
  - Botox vs saline injections
  - 0 6 scale by expert (0= no synkinesis; 6 = very severe)
  - Post injection: 0.5 +/- 1.1 vs 4.4 +/- 1.4 (p < 0.001)
- Patient-reported QoL, social functioning, and synkinesis all improved in Botox group (p < 0.5)</li>
- Borodic G. et al. Plast Reconstr Surg 2005

### Synkinesis and Botulinum

#### **UW Treatment Strategies**

- In conjunction with Neuromuscular Retraining Toxin usually after 6 mo NMR
- Timing and pattern of injections based on highly-detailed evaluation by Therapist (JD); SAQ, Sunnybrook FGS scores
- Goals personalized and specific
  - In general--Diminish synkinesis
  - Improve normal movement by relaxing counterproductive co-contracture

  - Improve patient comfort by reducing muscle contracture
  - Assist motor control / learning Toxin adjunct for "simplifying" the synkinetic problem

# Synkinesis and Botulinum

#### UW Treatment Strategies

- Small doses (< 1 unit to 2.5 units) onabotulinum toxin at key sites
  - · Almost always: platysma, orbic oculi, mentalis, corrugator,
  - Usually / Often: frontalis, buccinator, depr anguli oris, orbic oris
  - Sometimes: depressor labii inferioris, I.I. alaeque nasi
  - Avoid: zygomatic maj, zyg min, lev ang oris, lev labii superioris

WISCONSIN

• even when significant synkinesis / hypertonicity

# Commonly treated facial muscles



#### Orbicularis oculi Corrugator supracilii

- Mentalis
- Platysma
- Depressor anguli oris
- Frontalis
- Depressor labii inferioris



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### **Buccinator muscle**

 Buccinator was not a routinely evaluated or treated muscle in synkinesis patients, despite the prevalence of symptoms such as cheek biting, difficulty eating, and speech difficulties.



### **Buccinator functions**

- Chewing
- Whistling
- Sucking
- · Speech (fricative, plosive)
- · Flattening the cheek







Synkinetic





# Technique

- Sterilely reconstituted onabotulinumtoxin A (concentration 2.5 U per 0.1 mL) was given transorally to the buccinator muscle
- Other synkinetic facial muscles treated as well





|                      | 1 = seldom or not at all  |       |   |
|----------------------|---|-------|---|
|                      | 3 = sometimes or mildly   |       |   |
|                      | 4 = most of the time, or moderately   |       |   |
|                      | 5 = all the time, or severely   |       |   |
|                      |   |       |   |
|                      | Question  | Score | 1 |
|                      |   | (1-5) |   |
| Ι                    | When I smile, my eye closes   |       | ] |
| Ш                    | When I speak, my eye closes   |       | ] |
| ш                    | When I whistle or pucker my lips, my eye closes   |       |   |
| 111                  |   |       | 1 |
| IV                   | When I smile, my neck tightens  |       |   |
| IV<br>V              | When I smile, my neck tightens When I close my eyes, my face gets tight *   |       |   |
| IV<br>V<br>VI        | When I smile, my neck tightens           When I close my eyes, my face gets tight         *           When I close my eyes, the corner of my mouth moves         *                          |       |   |
| IV<br>V<br>VI<br>VII | When I smile, my neck tightens<br>When I close my eyes, my face gets tight *<br>When I close my eyes, the corner of my mouth moves *<br>When I close my eyes, my neck tightens              |       |   |
|                      | When I smile, my neck tightens When I close my cycs, my face gets tight When I close my cycs, the corner of my mouth moves When I close my cycs, my neck tightens When I cat, my cyc waters |       |   |

#### Results

- 42 patients
- 9:1 F:M ratio
- Mean follow up 5.5 years
- Mean dose of botulinum toxin to the buccinator per session was 2.0 units
- Mean total dose of botulinum toxin to all facial muscles administered per session was 54 units (range 31 – 108 units)

#### Results

- FGS scores showed a statistically significant improvement from a mean of 52 pre-injection to 66 (range 40 – 88) post injection (p < 0.0001)</li>
- SAQ scores showed a statistically significant improvement from a mean of 66.6 pre-injection to 45.0 post injection
- (p < 0.0001)

### Complications

• 3/42 (7%) bothered by temporary decreased tone/increased flaccidity of the cheek

#### Limitations

- Retrospective
- Relative value of NMR vs toxin unknown
- SAQ scores obtained from only 2/3 of the cohort

Treating buccinator with botulinum toxin in patients with facial synkinesis - a previously overlooked target

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# Botulinum for Synkinesis

#### Getting Started...

- A therapist familiar with facial synkinesis is most helpful
- Low doses are key
  - Usually 1.25 units or 2.5 units / site
  - 1.25 units x 1-2 sites for buccinator
- · Consider lagophthalmos and dry eye for periocular sites

#### Botulinum for Synkinesis

#### Getting Started...

- AVOID midfacial paralysis
   Improving SMILE is a primary motivator
- Caution with treating contralateral side
- Lateral orbic oculi, mentalis, platysma easiest starting targets



# Summary

Botulinum toxin potent modality in Rx of facial synkinesis

- hypertonicity
- spasms
- social interaction and selfconfidence
- overall patient quality of life



Mbango Sickness Mask Pende, Congo mid-20<sup>th</sup> century

