Botulinum toxin injections for tics: a registry based naturalistic study

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Background

- First case reports and case series on use of botulinum toxin for tics published in 1990s
- One Class II randomized crossover trial of botulinum toxin injections in 20 adolescents and adults with motor tics
  - Patients were treated with botulinum toxin or placebo for up to two simple motor tics, and crossed over to the other treatment after at least 12 weeks
  - Primary outcome was the number of treated tics per minute as observed on a 12-minute videotape protocol
  - Unweighted median proportional change in treated tics per minute was -39% during the botulinum neurotoxin phase and +5.8% during the placebo phase, with a median net effect of -37% (interquartile range, -77, -15%; p=0.0007)
- Recommended as a treatment for tics in AAN clinical practice guideline

Aim

- Following this clinical trial, very little practical guidance published on what type of tics clinicians should attempt to provide injections for, which muscles to target or appropriate dosages
- The aim of this study is to describe our experience using botulinum toxin in adults followed prospectively in our adult tic registry at the University of Calgary from 2021 to 2024
- We provide detailed information on the types of tics treated, the muscles injected and dosages to give guidance to clinicians wishing to provide this treatment

Methods

- The Calgary Adult Tic Disorders Registry is a prospective longitudinal study of adults with tic disorders
- Adults with previously or newly diagnosed tic disorders are followed longitudinally over 12 months
- Data collected includes the Yale Global Tic Severity Scale, the Gilles de la Tourette Quality of Life scale, presence and severity of psychiatric conditions, and medications for tics
- For this analysis, we focused on adults with primary tic disorders
- We analyzed data on the tics for which botulinum toxin was used, the specific muscles injected for each tic, and the dosage of botulinum toxin
- We assessed the length of treatment with botulinum toxin in months, reasons for treatment discontinuation, and if any other medications were taken concurrently

Results

- 95 adults with primary tic disorders participated in the Calgary Adult Tic Registry from January 2021 to April 2024
  - 81 TS, 12 PMTD, 1 PVTD
  - Mean age at participation was 33.0 years (SD 14.8, min 18, max 73)
  - 35% female sex
- Of the 95 participants, 63 had completed their 6-month assessment, and 55 had completed their 12-month assessment at the time of data analysis

Results

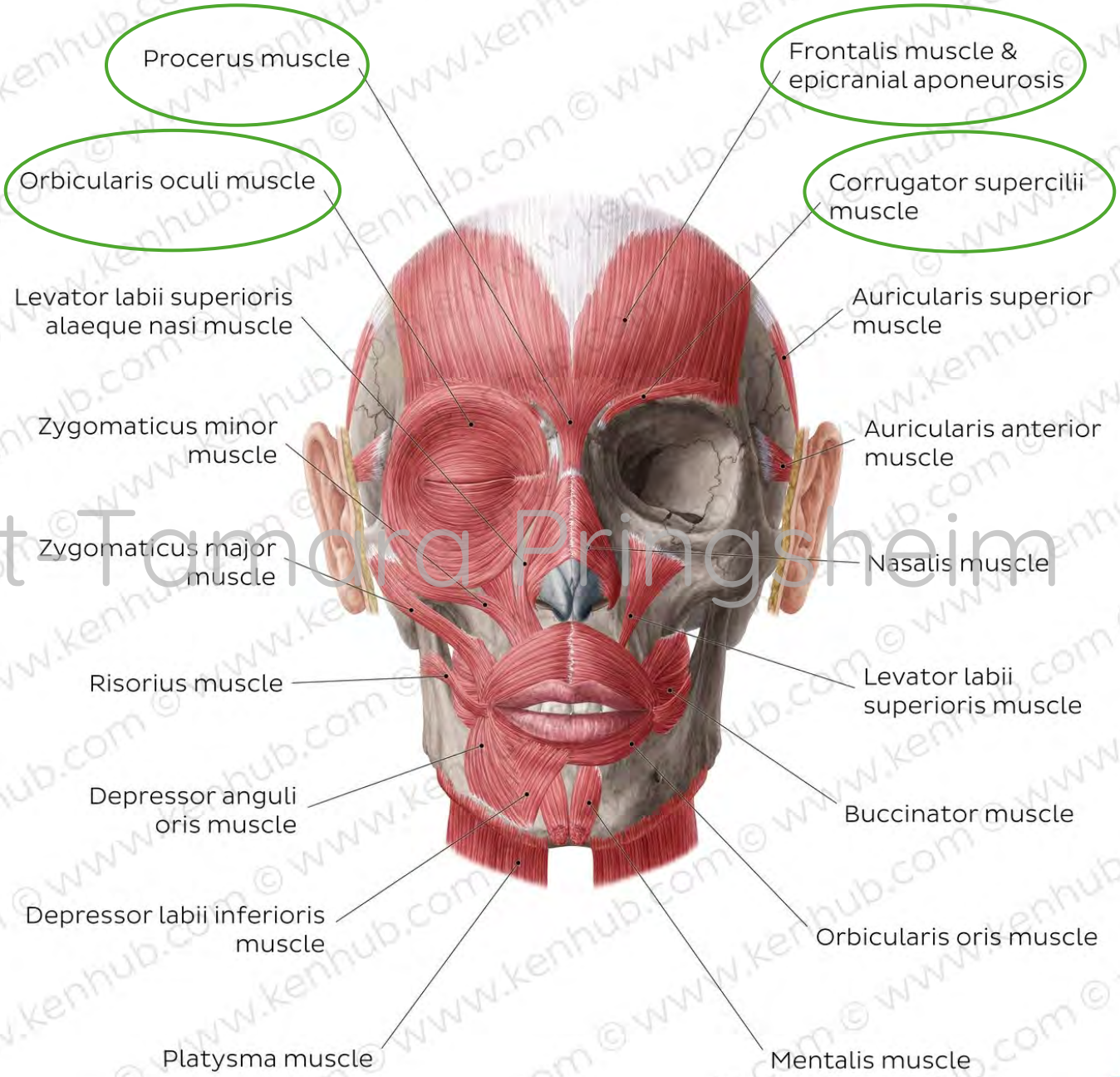
- Botulinum toxin (Botox) was the most used medical treatment for tics, with 32 of 95 (33.7%) registry participants receiving this treatment at some time during their enrolment period
  - Aripiprazole (n=21)
  - Guanfacine extended release (n=9)
  - Topiramate (n=8)
  - Clonidine (n=7)
  - Risperidone (n=4)
  - Clonazepam (n=3)
  - Fluphenazine (n=2)
  - Pimozide (n=1)
  - Quetiapine (n=1)

Types of Motor Tics Injected

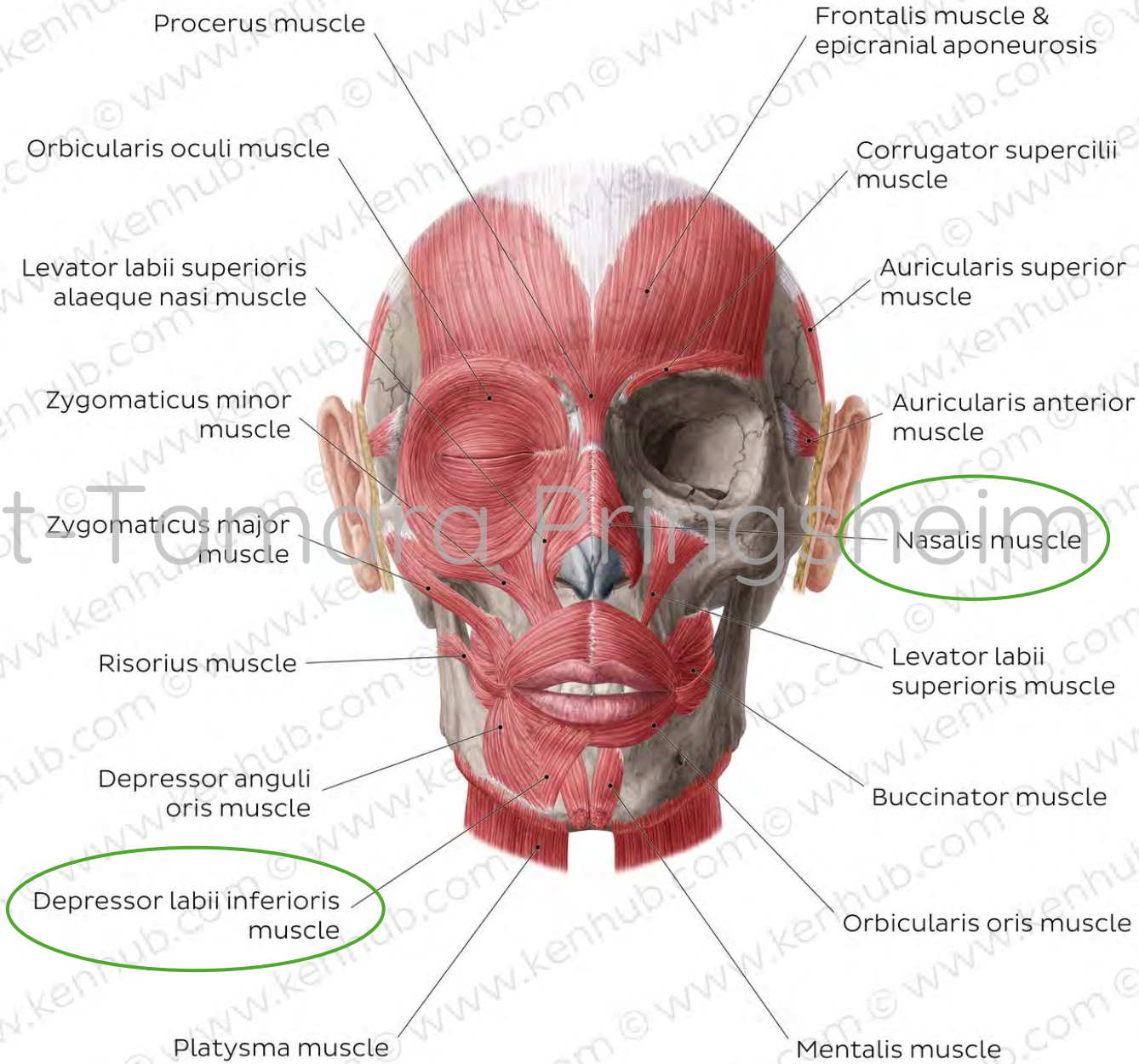
- eye blinking (n=12)
- head turn (n=12)
- shoulder raise (n=10)
- eyebrow depression (n=7)
- eyebrow raising (n=6)
- head flexion/extension (n=6)
- jaw clenching (n=6)
- lowering of midfacial muscles and jaw (n=4)
- nose wrinkling (n=2)
- winking (n=1)
- mouth movements (n=1)
- No registry participants received botulinum toxin injections for vocal tics

- Eye blinking
  - Orbicularis oculi
    - 12.9 units (5-22.5)
  - Corrugator
    - 7.5 units (5-10)
- Eyebrow depression
  - Corrugator
    - 6.8 units (5-10)
  - Procerus
    - 7.1 units (2.5-10)
- Eyebrow raising
  - Frontalis
    - 13.3 units (5-20)

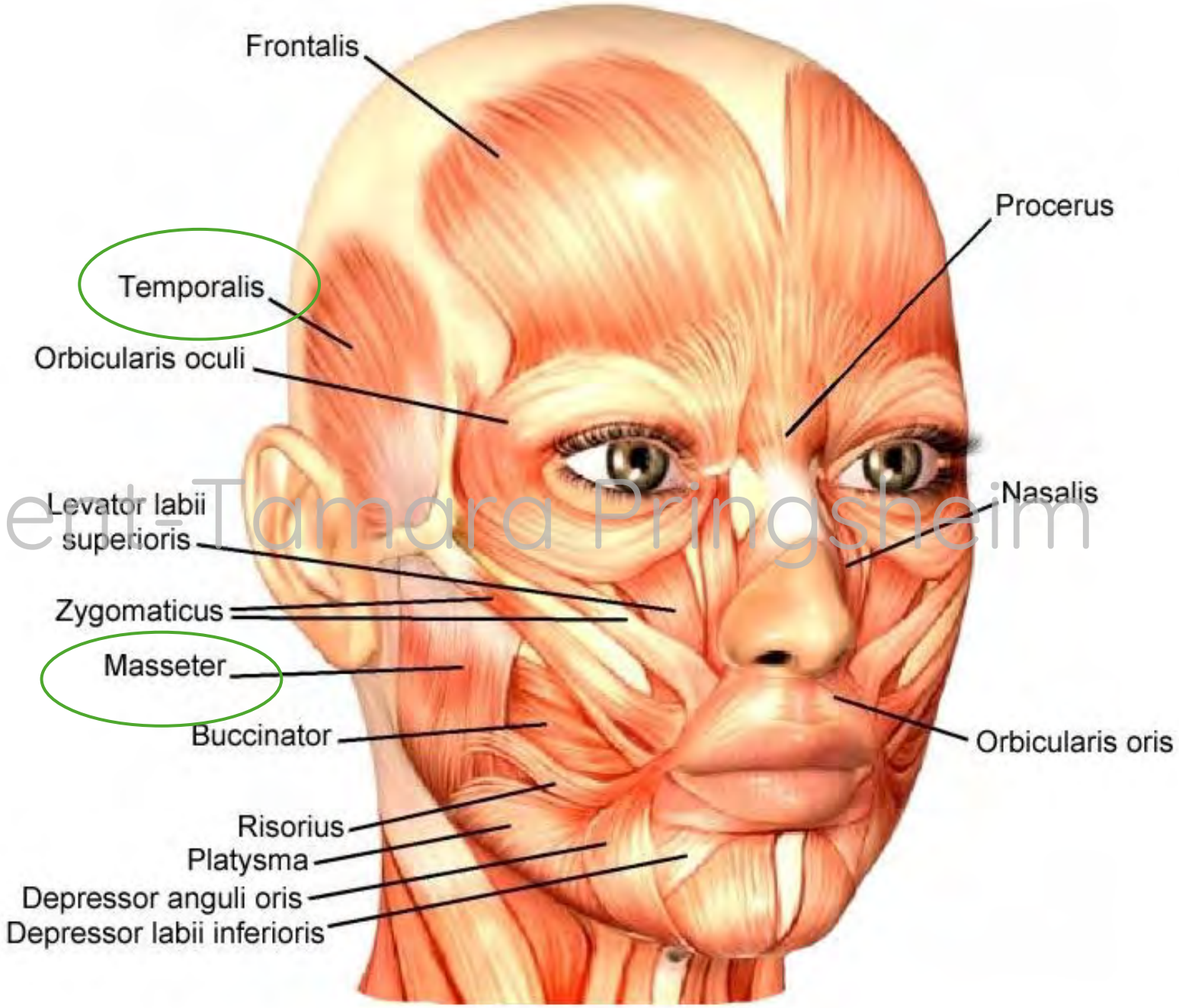
* dose per side



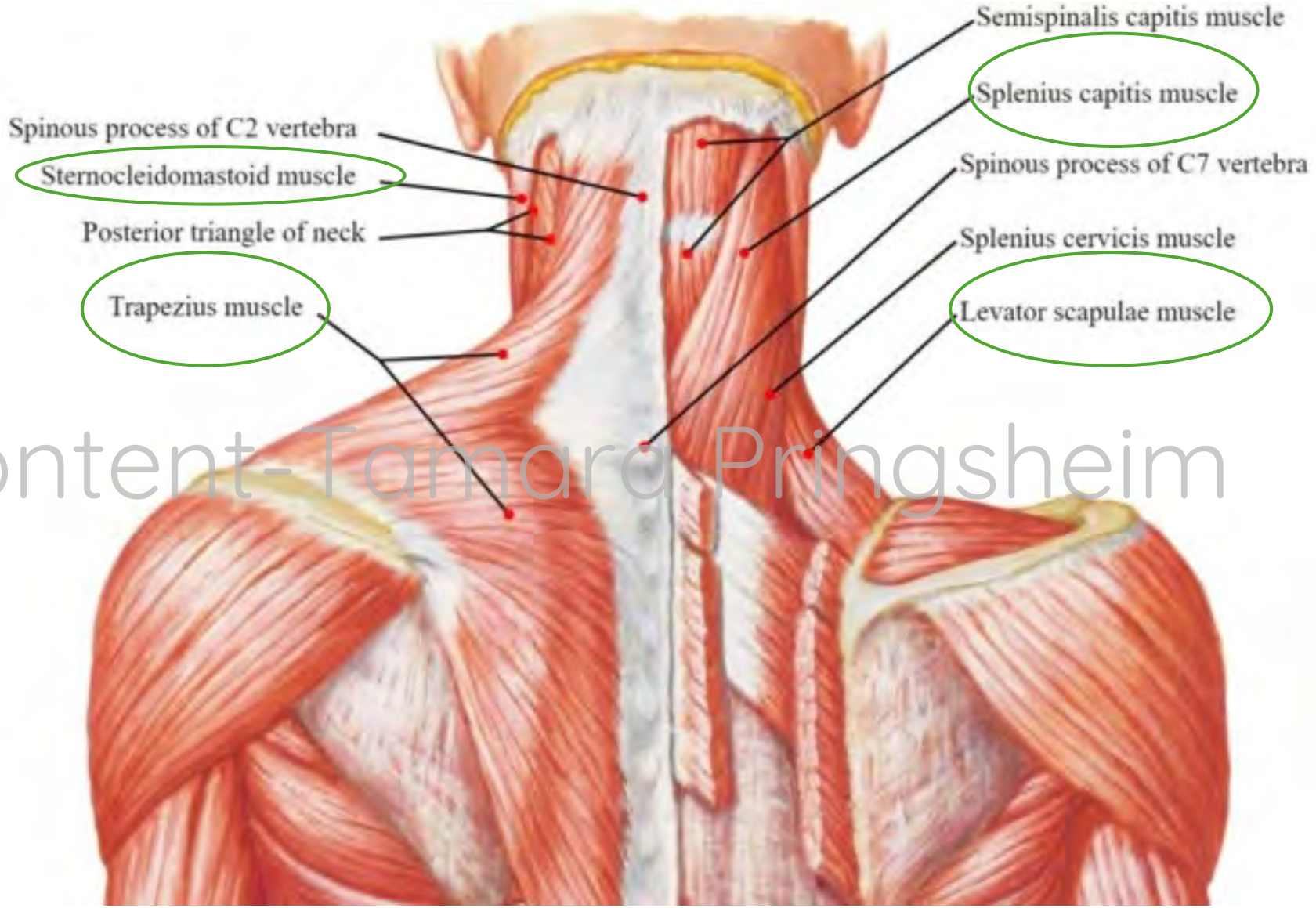
- Nose wrinkling
  - Nasalis
    - 4.5 units (4-5)
- Mouth movement
  - Depressor labii inferioris
    - 2 units



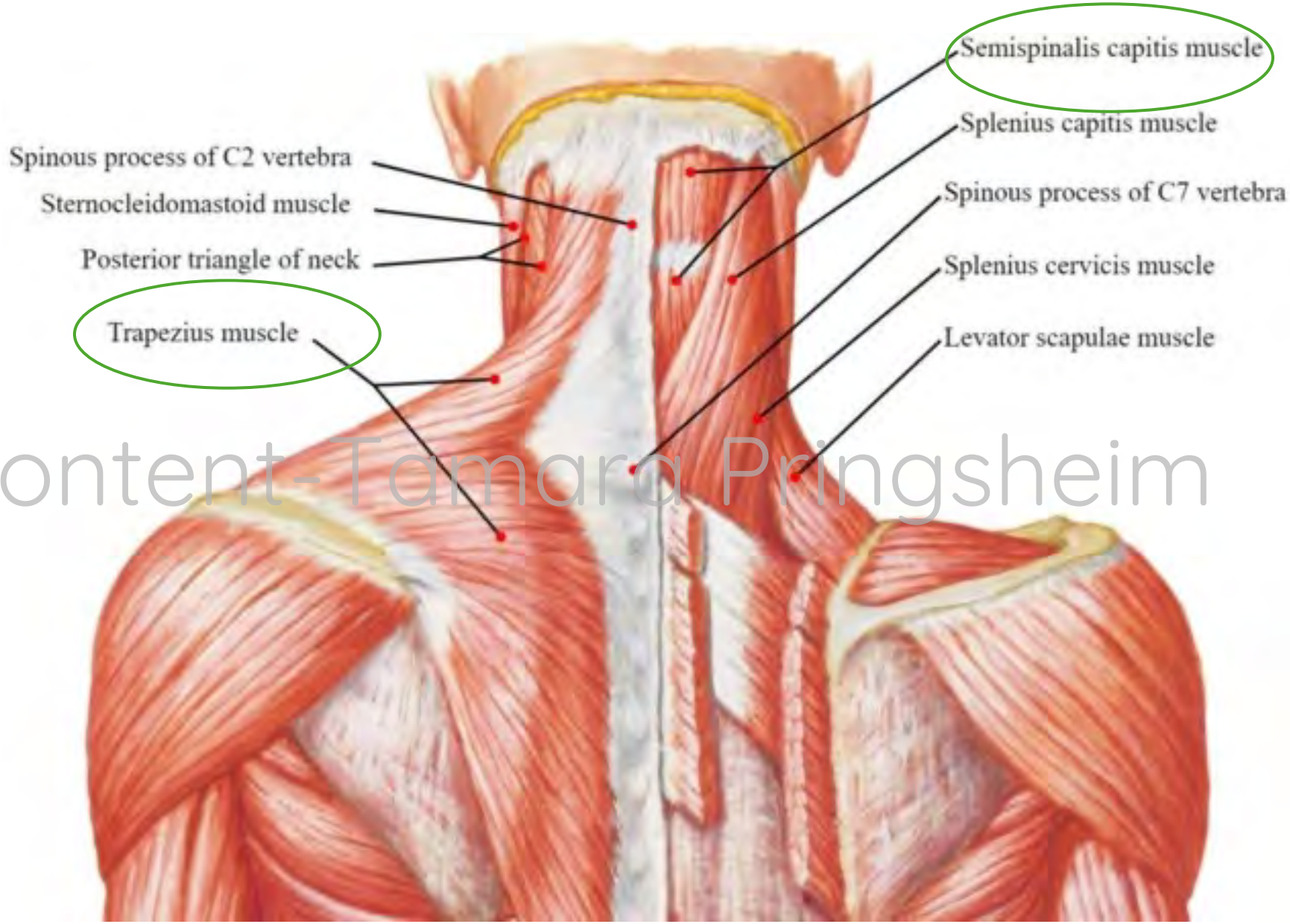
- Jaw clenching
  - Temporalis
    - 7 units (5-10)
  - Masseter
    - 9.2 units (5-15)



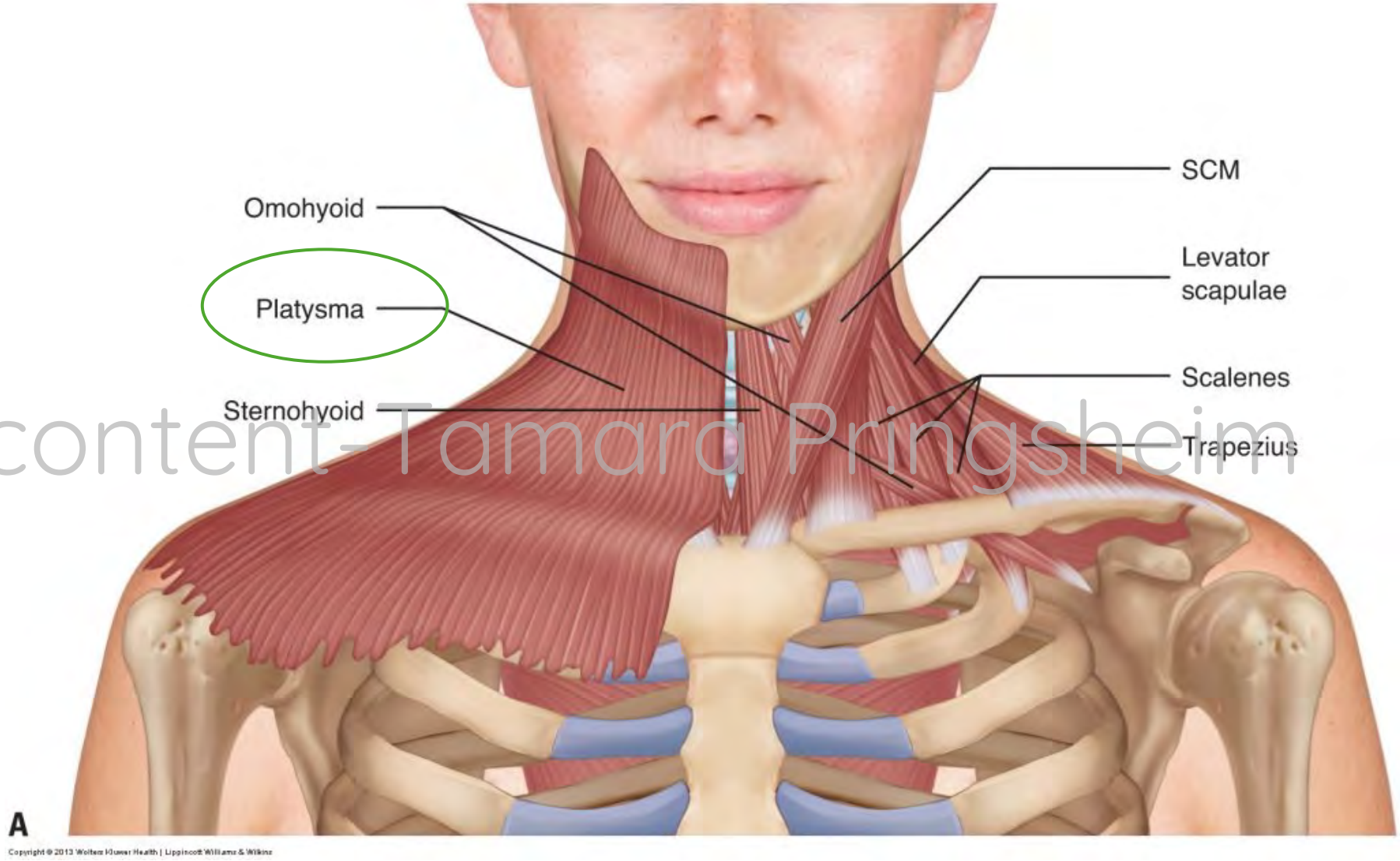
- Head turn
  - Splenius capitus
    - 31 units (5-70)
  - Sternocleidomastoid
    - 22 units (5-30)
  - Trapezius
    - 50 units
- Shoulder raise
  - Trapezius
    - 63.5 units (15-125)
  - Levator scapulae
    - 50 units



- Head flexion / extension
  - Semispinalis capitus
    - 30 units (20-50)
  - Trapezius
    - 25 units



- Lowering of midfacial muscles and jaw
  - Platysma
    - 15 units (10-20)



Results

- Mean length of treatment with botulinum toxin was 40.4 months (range 3-101)
- 19 of 32 (59%) participants continued to receive botulinum toxin injections every three months at the time of data analysis
- Treatment discontinuation
  - 5 patients due to lack of efficacy
    - 3 patients started an antipsychotic medication (decreasing tics to the extent that botulinum toxin was no longer necessary)
    - 2 patients discontinued due to moving out of town or were lost to follow up
    - 2 patients stopped treatment due to pregnancy: one resumed post pregnancy, and one remained pregnant at the time of data analysis
- 11 patients took an oral medication in addition to receiving botulinum toxin injections
  - 4 topiramate, 3 aripiprazole, 2 clonazepam, 1 guanfacine extended release, 1 clonidine

Conclusion

- Botulinum toxin injections are a highly acceptable treatment for adults with tics
- Most commonly used treatment in our registry participants
- Antipsychotic sparing strategy
- Useful skill for physicians who treat tic disorders