Non-cosmetic Applications of Botox in the Head and Neck

Presenter: Eugene Son, MD
Mentor: Michael Underbrink, MD, MBA
The University of Texas Medical Branch
Department of Otolaryngology
Grand rounds presentation
September 17, 2014
Overview

- Review of botulinum toxin
- Review of specific conditions in H&N
  - Voice and swallowing conditions
  - Pain conditions
  - Facial conditions
  - Autonomic conditions
Review of Botulinum Toxin
Botulinum Toxin

• Produced by Clostridium botulinum.

• 7 serotypes (A-G).

• Types A and B available for clinical use.
  • Prescription only

• BOTOX first approved by FDA in 1989 for blepharospasm and strabismus.

• FDA approved
  • OAB
  • Detrusor overactivity
  • Chronic migraine
  • Upper limb spasticity
  • Cervical dystonia
  • Axillary hyperhidrosis
  • Blepharospasm
  • Strabismus

• Limited
  • Episodic migraine
  • Upper limb spasticity in pediatric
  • Lower limb spasticity in adults
  • Hyperhidrosis elsewhere
Preparations

• **Type A**
  - BOTOX by Allergan, Inc.
  - Dysport by Ipsen Pharmaceuticals
  - Xeomin by Merz
  - Puretox by Mentor
  - Reloxin in Europe
  - BTXA in China

• **Type B**
  - Myobloc/NeuroBloc by Solstice Neurosciences (US, Europe, Japan)

• **Units and dosing specific to each product**
  - Conversion tables not recommended

• **BOTOX comes as 100 U vial as freeze-dried powder**
  - Reconstitute with sterile saline

BOTOX Highlights of Prescribing Information. Allergan 2014.
Mechanism of Action of BTX-A
Mechanism of Action of BTX-A

1. 100 kD heavy chain domain of toxin mediates specific and irreversible binding to cholinergic receptor site on presynaptic membrane of motor axon terminal.
2. Toxin internalized via energy-dependent, receptor-mediated endocytotic/lysosomal vesicle pathway.
3. disulphide bond then cleaved and 50 kD light chain is translocated across endosomal membrane.
4. 50 kD light chain cleaves SNAP-25 (synaptosome associated protein), preventing exocytosis-mediated Ach release.
*BTX-B cleaves the protein VAMP – shorter duration but earlier onset of action.
Acetylcholine (ACh)

• Peripheral nervous system (PNS)
  • Neurotransmitter to skeletal muscle
    • Opens ligand-gated calcium channels in the neuronal cell membrane
    • Calcium enters the cell, producing Ach release
    • ACh binds to its nicotinic receptors on skeletal muscle fibers

• Autonomic nervous system (ANS)
  • Muscarinic receptors
    • Myoepithelial cells in sweat and salivary glands
  • Pre- and post-ganglionic parasympathetic neurons
  • Pre- and post-ganglionic sympathetic neurons

• Central nervous system (CNS)
Adverse Effects

- Over-weakening of targeted muscle
- Diffusion to surrounding muscles
  - Ptosis
  - Asymmetry of face
  - Dysphagia
  - Dyspnea
- Development of antibody (rare)
  - Clinical resistance
  - Prevent by using minimal therapeutic dose without “touch-ups”
- Local
  - Pain
  - Edema
  - Erythema
  - Numbness
  - Bruising
- Flu-like symptoms
- Headache
- Nausea
- Anaphylaxis
Contraindications

• Infection at injection site
• Pregnancy (Category C)
• Breast feeding
• Neuromuscular disorders
  • Myasthenia gravis
  • Eaton-Lambert syndrome
  • ALS
• Concurrent aminoglycoside treatment
• Sensitivity to botulinum toxin or any other compounds in preparation
Antidote

• Pyridostigmine
  • Reversible acetylcholinesterase inhibitor
  • FDA approved for MG Tx
  • Off-label emergency reversal of nondepolarizing NMJ blockers in anesthesia
    • Young et al, retrospective case study of patients receiving BOTOX for H&N dystonia
      • 20 cases reviewed
      • Modulate dysphagia, breathiness, dyspnea, autonomic symptoms
      • 1 significant adverse effect of bradycardia

• Ptosis
  • Apraclonidine ophthalmic drops (0.5 to 1%)
    • Used to decrease IOP
    • Sympathomimetic
    • Alpha-2-adrenergic agonist

Review of Specific Conditions in H&N

- Voice and swallowing conditions
- Pain conditions
- Facial conditions
- Autonomic conditions
Voice and Swallowing Conditions

- Spasmodic dysphonia (SD)
- Essential voice tremor
- Vocal fold granulomas
- Vocal tics
- Other laryngeal disorders
- Dysphagia
- Esophageal speech
Laryngeal Anatomy

- **Adductors:**
  - LCA
  - TA
  - IA

- **Abductors:**
  - PCA

- **Tensors:**
  - Cricothyroid

Injection Techniques (1)

Percutaneous injection with EMG guidance is quicker, more precise, uses the lowest therapeutic dose, but has the steepest learning curve.

Percutaneous injection with laryngoscopic guidance is less precise.
Supraglottic injection with laryngoscopic guidance

- **Advantages**
  - More gradual/smooth onset of action
  - Smoothing of TVC
  - Less severe breathy voice (may be preferred in professional voice)
  - Preserves singing pitch control

- **Disadvantages**
  - Shorter duration (6-8 wk)
  - Less predictable result
Injection Techniques

Injection Techniques

1. Needle through cricothyroid membrane into TA-LCA muscle complex
   1. Sustained “ee” or Valsalva for adduction
   2. 2-3 mm off midline through cricothyroid membrane

2. EMG needle into PCA muscle, using retrolaryngeal approach
   1. Sniffing for abduction
   2. Posterior to the posterior border of the thyroid cartilage, near inferior extent
   3. Hit cricoid

3. EMG needle into PCA muscle, using translaryngeal approach
   1. Endolaryngeal mucosal violation, needs topical anesthetic
   2. Go through cricoid
Injection Techniques

Spasmodic Dysphonia (SD)

• SD is a focal dystonia of intrinsic laryngeal muscle

• Types
  • Adductor (MOST COMMON)
    • Inappropriate glottic closure resulting in strangled breaks in connected speech
    • Treatment: BTX injected into the TA-LCA muscle complex
  • Abductor
    • Inappropriate glottic opening resulting in breathy breaks and hypophonia
    • Treatment: BTX injected into the PCA muscle
  • Mixed
SD Treatment

- Preferable volume of injection per vocal fold is 0.1 cc (0.2 is ok)
  - Base concentration on targeted dose

- Adductor SD
  - Bilateral EMG-guided, percutaneous injections of TA-LCA muscles
  - First dose is 1.25 U BOTOX per side
  - Rosow et al compared 1.25 vs 2.5 as initial dose
  - Blitzer says to convert B:A 52.3:1

- Abductor SD
  - Bilateral (staggered) injections of bilateral PCA muscles
  - First PCA injected with 5 U BOTOX (staggered and asymmetric)
  - PCA technically more challenging to inject
  - Dyspnea

- Initial period of weakness for several days then by 3-4 month plateau
- Complications: dysphagia to liquids, dyspnea, stridor

SD Treatment

• Morzaria study
  • Prospective case series testing VHI, VHI-10, V-RQOL in BOTOX for ADSD.
  • N=37, Avg BOTOX dose 0.88 U
  • All 3 instruments showed significant improvement
    • VHI
      ◦ 23.49 ± 8.64 (functional) -> 16.49 ± 8.63 (functional)
      ◦ 23.43 ± 9.51 (physical) -> 18.54 ± 9.28 (physical)
      ◦ 22.76 ± 10.51 (emotional) -> 16.14 ± 9.80 (emotional)
      ◦ 69.95 ± 22.23 (total) -> 51.11 ± 21.14 (total)
    • VHI-10
      ◦ 24.54 ± 7.19. -> 15.64 ± 6.90
    • V-RQOL
      ◦ 41.22 ± 24.50 (social-emotional) -> 80.27 ± 18.73 (social-emotional)
      ◦ 43.70 ± 22.10 (physical functioning) -> 83.36 ± 15.18 (physical functioning)
      ◦ 47.50 ± 19.26 (total) -> 87.64 ± 12.05 (total)
Objective. To determine the responsiveness of the Voice Handicap Index (VHI), Voice Handicap Index-10 (VHI-10), and Voice-Related Quality of Life (V-RQOL) to the treatment effect of botulinum toxin (Botox) in adductor spasmodic dysphonia (ADSD).

Essential Voice Tremor (1)

• Age-related disorder of involuntary muscle contraction
  • Essential tremor
  • Parkinson’s Disease

• Rhythmic, oscillatory movement of vocal tract

Essential Voice Tremor (2)

- **Treatment**
  - Bilateral symmetric injection of TA-LCA muscles with BOTOX and/or supraglottis (FVC)
  - Randomized, prospective case series by Adler
    - N=13 with voice tremor
    - Patients received 1.25 U (n=5), 2.5 U (n=5), or 3.75 U (n=3) of botulinum toxin type A in each vocal cord
    - Mean tremor severity scale scores improved 1.4, 1.6, 1.7 points at wk 2, 4, 6.
    - Improvement in patient rated functional disability, independent ratings of videotaped speech, acoustic measures of tremor
Vocal Fold Granulomas

- Etiology is from chronic irritation
  - Chronic cough
  - LPRD
  - Seen in men more commonly

- Held-back quality voice, habitual coughing/throat clearing, low and monotone voice

- Treatment
  - Goal – weaken vocal adductory force of arytenoid
  - Primary Tx is speech therapy and anti-reflux medications (conservative)
Vocal Fold Granulomas

**Treatment**

- Surgery is next step +/- BOTOX
  - Injection of BOTOX into ipsilateral or bilateral TA-LCA muscles ranging from 1.25-20 U, usually 5 U unilaterally.
  - IA also injected
  - Severe breathy voice

- Blitzer et al. Use 2.5 – 5 U in each TA-LCA

- Retrospective case review by Damrose
  - N=7 injected 10-25 U divided between TVC into TA-LCA
  - All with resolution in 2-7 wk
    - No aspiration, all had some hoarseness

- Retrospective case review by Fink
  - N=8 refractory to prior PPI, VT, Sx injected IA with 5-25 U
    - 1 had no improvement, 2 had partial resolution,
    - 5 had complete resolution, 4 had breathiness and no other S/E
Functional Disorders

• Plica ventricularis
  • AKA Ventricular dysphonia
  • Hyperfunction of supraglottis with excessive adduction of FVC
  • Treatment is speech therapy
    • If fail, may try injection of BOTOX into aryepiglottic muscle
  • Case series by Kendall and Leonard
    • N=7 injected FVC/aryepiglottic folds with relief in 5.

• Paradoxical vocal fold motion
  • Inappropriate adduction of TVC during inspiration
  • Wide range of proposed causes and treatments
  • BOTOX injections in severe or refractory cases

Other Laryngeal Disorders

• Disorders
  • Arytenoid dislocation needing arytenoid rebalancing
  • Chronic idiopathic cough
    • Weakening TA-LCA can allow less opposition for better airway caliber

• Disorders
  • Vocal fold paralysis
    • Vs. cordectomy/cordotomy
  • Posterior glottis stenosis
  • Principle
    • Weakening TA-LCA can allow PCA to have less opposition for better airway caliber
Vocal Tics

• Neuropsychiatric disorder of uncontrolled motor and phonic impulses

• Symptoms
  •Ranges from simple sniff or bark to coprolalia
  • Associated psychiatric disorders including OCD, ADHD

• Treatment
  • Psychiatric medications and therapy
  • BoNT to larynx for reduction, suppression, decrease volume
    • Used only as adjuvant symptomatic treatment
    • 2.5 U to bilateral TA-LCA
    • Randomized, controlled, double-blind case series by Marras
      • N=18 injected
      • 37% reduction in tic frequency compared with saline placebo
      • Decreased urge also

Cricopharyngeus

- Upper esophageal sphincter (lower third)

- Causes:
  - Oropharyngeal dysphagia
    - Circopharyngeal achalasia
  - Tracheoesophageal (TEP) speech difficulty

- Oropharyngeal dysphagia
  - Diagnosis
    - “cricopharyngeal bar” on swallow study
    - Manometry, EMG
  - Treatment
    - Mechanical dilatation, pharyngeal plexus neurectomy, myotomy (definitive)
    - Chemical denervation
Tracheoesophageal puncture after laryngectomy

Case series by Lewis

- N=23 TEP with failure of conversational speech with 50 U
- 87% achieved fluent TE speech after injection, 5 required additional injection
- 2 declined further intervention and 1 failed.
Cricopharyngeus

**Injection Technique**
- Percutaneous
  - EMG needed
    - Confirm with rest and relaxation during swallowing
    - AP that cease with swallowing and do NOT change with sniffing (avoid PCA)
    - Lateral and posterior to cricoid cartilage
  - 20-40 U on each side
  - Unilateral to avoid bilateral PCA paralysis

**Endoscopic**
- GA
- DL with suspension (similar to Zenker’s)
- R/o other dysphagia causes
- Probe correct area
- Do NOT inject inferior constrictor -> worsen dysphagia
- 1 or 2 areas in on each side
Pain Conditions

- Headache
- TMD
- Trigeminal Neuralgia
Muscles of Mastication

Netters, FH. Atlas of Human Anatomy. Saunders; 2010

LABELS ON NEXT SLIDE.
Muscles of Mastication

- Lateral pterygoids 2 heads:
  - Superior head originates on greater wing of sphenoid
  - Inferior head originates on lateral surface of lateral pterygoid plate
  - Both converge and insert on medial condyle

- Unilateral action causes deviation, bilateral action causes protrusion

- Medial pterygoids originate from medial side of lateral pterygoid plate and originate on angle of mandible
Neck Musculature
Headache (1)

• Types
  • Migraine
    • Headache lasting for hrs-days with assoc n/v, photo- phono-phobia, blurry vision
    • FDA approved for **chronic** migraine
    • At least 15 headache days per month for at least 3 months w/o medicine abuse
    • Treatment includes abortive and preventative medical therapy
  • Tension-type headache
    • Band-like sensation around neck or head, “vice-like,”
    • Treatment includes behavioral therapies and medications similar to migraines
Headache (2)

• Treatment
  • Botox for headaches derived from anecdotal reports
  • Mechanism unclear but some theories
    • Direct antiproprioceptive effects on nerves
    • Corrugator muscle contraction stimulating trigeminal nociceptors passing through muscle
    • Inhibit release of substance P, glutamate, CGRP -> blocking nociceptive signals

• Muscles injected
  • Corrugator supercilii muscle
  • Procerus
  • Frontalis
  • Temporalis
  • Others: trapezius, splenius, semispinalis

Headache (3)

• Chronic Migraines (CM)
  • PREEMPT (2 phase III trials)
    • 24 wk double-blind, placebo-controlled
    • BOTOX in CM
    • N=1384, 1005 completed all Tx
    • Significantly reduced
      • Frequency of HA days
      • Migraine days
      • Moderate/severe HA days
    • Large mean improvements
      • Cumulative hr of HA/day
      • Frequency of HA episodes
      • Improvement in QOL tools
Temporomandibular Joint Disorders (TMD)

- 2 forms
  - Myogenous
  - Arthrogenous

- Other causes
  - Malocclusion
  - Masseteric hypertrophy
  - Bruxism (psychosocial factors)
  - DJD, RA, ankylosis, trauma

- Symptoms
  - Referred otalgia, HA, clicking

- PE
  - Dentition, TMJ palpation, masticator muscles palpation
TMJ

• Synovial joint with articular surfaces:
  • condyle inferiorly
  • articular tubercle and mandibular fossae of squamous portion of temporal bone superiorly.

• Surfaces separated by meniscus (articular disk)

• Four muscles
  • Masseter
  • Temporals
  • Lateral Pterygoid
  • Medial Pterygoid
TMD

• Treatment
  • Soft diet, bite guard, NSAID, other conservative therapy, surgery

• BOTOX
  • Masseter
    • 25-50 U each
  • Temporalis
    • 10-25 U each
  • Lateral Pterygoid
    • Intraoral injection between lateral pterygoid plate and coronoid process
      • 7.5-10 U each
  • Clinical trials by Freund and Schwartz
    • 150 U BOTOX to masseters and temporalis improved pain, function, mouth opening, TTP
    • Success with bruxism, clenching, hypertrophy, trismus, hypermobility
TMD

• Complications
  • Weakness in chewing
  • Muscle wasting
  • Diffusion to zygomaticus major -> asymmetric smile

• Follow-up
  • Re-assess in 2 wks
Trigeminal Neuralgia (1)

• Unilateral facial pain disorder

• Symptoms
  • Brief, paroxysmal, sharp lancinating
  • One or more divisions of trigeminal nerve

• Treatment
  • Anti-convulsants, decompression surgery, gamma knife, BOTOX

Trigeminal Neuralgia (2)

- **BOTOX**
  - Draw grid on area of allodynia
  - 2.5 U per square cm, intradermally
  - Keep log of grid/diary of symptoms

- **Case series by Bohluli**
  - N=15 injected with 50 U in trigger points.
  - 100% with improved frequency and severity of pain attacks
  - 7 became pain free
## Facial Conditions

<table>
<thead>
<tr>
<th>Meige syndrome</th>
<th>Cervical dystonia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blepharospasm</td>
<td>Hemifacial spasm</td>
</tr>
<tr>
<td>Oromandibular dystonia</td>
<td>Facial synkinesis</td>
</tr>
<tr>
<td>Palatal Myoclonus</td>
<td></td>
</tr>
</tbody>
</table>

---
Meige Syndrome

• Typically happens in ages 30 -70 yrs of age, mostly in 60s

• Combination of essential blepharospasm and oromandibular dystonia
  • Progress in intensity and stabilizes
  • Bilateral, symmetric, non-rhythmic lasting seconds to minutes
  • Triggered by psychosocial stressors

• Treatment
  • Dopaminergics/anticholinergics, benzo’s
  • Geste antagonistique
  • Treatment of choice is BOTOX
Blepharospasm

- Dystonia of facial muscle causing increased blinking to visual disturbances
- Involves orbicularis oculi, sometimes corrugator superciliaris and procerus muscles
- Approved by FDA for this purpose
- Cochrane Review by Costa
  - 90% benefited overall making it unethical to perform new placebo controlled trials.
- Treatment
  - 12-15 U into 3-6 sites peripherally at the lateral orbital rim
  - 1.25 U in 2 sites on the superior palpebral portion avoiding middle
  - Different techniques used

Oromandibular Dystonia

• Dystonic muscular contractions affecting lower face
  • Involuntary contractions moving the mandible
  • Can cause jaw pain, eating difficulties, dysarthria

• Types
  • Jaw opening, closing, protrusion, deviation
  • Closing type best treated with BOTOX

• Retrospective chart review by Sinclair
  • N=59
  • Suggests >60% had over 50% functional improvement
  • Long term management with BOTOX has minimal morbidity (no FN paresis)

Oromandibular Dystonia

- EMG needle used and jaw movements used to confirm placement

- Jaw deviation/protrusion
  - Lateral pterygoid muscles injected

- Jaw closing
  - Masseter
  - Temporalis muscle
  - Medial pterygoid muscles

- Jaw opening
  - Submental muscles
    - Digastrics, genioglossus, geniohyoid, mylohyoid, hyoglossus
  - Lateral pterygoids
  - Platysma
Cervical Dystonia (1)

• Focal dystonia that affects neck and shoulders
  • Can be tonic, clonic, tonic-clonic
  • Abnormal movements
    • Twisting (torticollis)
    • Tilting (laterocollis)
    • Flexion (anterocollis)
    • Extension (retrocollis)
    • Shoulder elevation

• Incidence of 9-30 per 100000 in US, F:M 2:1, 40-60’s yo

• Abnormality in central motor processing

• Treatments – sensory trick, anticholinergics, BZ, baclofen, tetrabenazine
Cervical Dystonia (2)

• Twisting (torticollis)
  • Ipsilateral splenius capitis (SC)
  • Contralateral SCM

• Tilting (laterocollis)
  • Ipsilateral SCM
  • Ipsilateral SC
  • Ipsilateral levator scapulae
  • Ipsilateral trapezius

• Flexion (anterocollis)
  • Bilateral SCM
  • Bilateral scalene
  • Bilateral submental complex

• Extension (retrocollis)
  • Bilateral SC
  • Bilateral upper trapezius

• Shoulder elevation
  • Ipsilateral levator scapulae
  • Bilateral trapezius
Cervical Dystonia (3)

- Chemical denervation with BOTOX
  - Cochrane review by Costa
    - 13 RCT but all of short duration
    - All objective and subjective rating scales measuring impairment/disability improved significantly
      - Except 1 study with N=20
      - Single injection of BOTOX is effective and safe for CD

- Commonly injected muscles
  - SCM
    - Rostral third to avoid dysphagia
  - Trapezius
  - Splenius capitis
  - Levator scapulae

Hemifacial Spasm (1)

• Incidence of 1 in 10,000; more common in females
• Segmental myoclonus in a recurrent, involuntary, synkinetic dystonic muscular contractions of the face.
  • Not a dystonia
  • Usually unilateral involving orbicularis oculi
  • Cause: aberrant vascular loop from PICA causing compression
    • Or... tumor compression, vascular malformation
Hemifacial Spasm (2)

- Treatment
  - Anti-epileptics (carbamazepine, baclofen, BZ)
  - BOTOX shown to be effective
  - Prospective placebo-controlled blinded study by Yoshimura
    - N=11, each had 4 sets of injections to various muscles
      - 3 were botox and 1 was placebo
      - 79% had subjective improvement with botox, 1 patient improved with placebo
      - 84% had objective improvement with botox
Facial Nerve Synkinesis

• Presence of unintentional motion produced by intentional movement in another area of the face
  • Sequelae of facial nerve paralysis
  • Most common is oculo-oral involving involuntary oral commissure movement with eye closure
  • Cause is aberrant axonal regeneration and facial nucleus hyperexcitability

• Treatment
  • Surgery, physical therapy, Botox
  • Retrospective review by Couch
    • N=22
    • Significant improvement
      • Facial comfort and social function
    • Not significant
      • Oral function, eye comfort, facial movement, lacrimal control

Palatal Myoclonus

- Rhythmic muscular contraction of soft palate
- AKA palatal tremor
- Most common presenting symptom
  - Clicking tinnitus
- Muscles involved
  - Tensor veli palatini (TVP)
  - Levator veli palatini
  - Musculus uvulae
  - Palatoglossus
  - palatopharyngeus

Palatal Myoclonus (1)

• Retrospective chart review at 2 institutions by Sinclair
  • N=15
  • F:M, 3:2
  • 46.7% had tinnitus, 53.3% had nonaudible awareness of mvt
  • 2.5 u injected in TVP transorally
  • 14 had BOTOX and 12 had improvement in symptoms
Palatal Myoclonus (2)

• Treatment
  • BOTOX 2.5 – 5 U per side
  • EMG to locate tensor veli palatini
  • Location:
    • Trans-oral
    • 3 – 5 mm posterior to posterior edge of hard palate in lateral half of soft palate
  • Some have injected the levator veli palatini or salpingopharyngeus muscle via endonasal endoscopic approach

• Complications
  • VPI
  • Dysphagia with pharyngeal muscles
  • ETD, may need BMT
Autonomic Conditions

Frey’s Syndrome
Sialorrhea
Frey’s Syndrome (1)

• AKA auriculotemporal syndrome, gustatory sweating

• After parotidectomy

• Sweating from activation of eccrine sweat glands from inappropriate cholinergic stimulus from parasympathetic fibers of the auriculotemporal branch of the trigeminal nerve.

• Diagnosis (clinical)
  • Minor’s starch-iodine test

• Treatment
  • Scopolamine, anti-perspirants
  • Preventative measures during surgery
Frey’s Syndrome (2)

• Botox Injection
  • Minor’s starch-iodine test
  • Mark out a grid of the blue-black area
  • 2.5 U per square cm
  • F/up 2 wk to re-assess

• Mostly small case series
  • Cantarella showed improvement with Tx
    • Majority pts symptom free after 12-18 mo

• Theory
  • Long duration
  • Feeble regeneration
  • Post-trauma compromises regeneration

Image from https://wiki.uiowa.edu/display/protocols/Botox+Injection+for+Frey+y+Syndrome
Sialorrhea (1)

- Salivation beyond lip margin after 4 yo
  - Poor oral/facial muscular control
  - Hypersecretion
  - Associated conditions
    - Stroke, ALS, PD, CP, MR

Sialorrhea (2)

**Treatment**
- Conservative measures, anticholinergics, XRT, surgery
- BOTOX
  - EMG guided to avoid musculature
  - Ultrasound guided
  - Palpation used to inject whole gland
- RCT by Jackson
  - N=20, sialorrhea refractive to medical therapy in ALS
  - 2500 U type B or placebo into bilateral parotid and submandibular glands using EMG
  - Botox: Global improvement in 82% at 2 wk, 50% at 12 wk
  - Placebo: Global improvement in 38% at 2 wk, 14% at 12 wk

Other conditions

- Stapedial myoclonus – 1 case report
- Rhinorrhea – couple RCT, improves rhinorrhea but not nasal congestion
- Chronic neck pain – no benefit, Cochrane review of 9 trials shows no benefit than placebo
- Stuttering – 1 case series
Conclusion

• Botulinum toxin can be used in many conditions in H&N.

• Dystonias in the larynx and superficial facial and cervical musculature area are effectively and safely treated with injection of botulinum toxin (off-label).

• EMG guidance is helpful with injections to locate or avoid skeletal muscle.

• Autonomic dysfunction involving acetylcholine as a neurotransmitter is also effectively treated with botulinum toxin.
Bibliography

- BOTOX Highlights of Prescribing Information. Allergan 2014.


