USE OF NEUROTOXINS IN MOVEMENT DISORDERS

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DISCLOSURES

• No disclosures related to this topic
• Off-label use will be discussed
OUTLINE

• 1. Background history and mechanism of action of botulinum toxins
• 2. Comparison of subtypes
• 3. Clinical uses in Movement Disorders
BACKGROUND AND HISTORY

1800s
Clostridium botulinum identified in 1890s
"Sausage poison" in Germany as it was associated with eating undercooked blood sausages

1980s
Used for blepharospasm, hemifacial spasm, cervical dystonia

1989
Onobotulinumtoxin A (Botox) FDA approved for strabismus, blepharospasm and hemifacial spasm

2000s
All botulinum toxins FDA approved for cervical dystonia

1970s
First used for strabismus

2018
Incobotulinumtoxin A (Xeomin) FDA approved for sialorrhea
• German physician Justinus Kerner was the first to consider using botulinum toxin as a therapy for certain medical disorders.

• In 1822, Kerner described the clinical symptoms of 76 cases of “sausage poisoning” – blurry vision, drooping eyelids, slurred speech, difficulty swallowing, vomiting and severe muscle weakness. He observed that the illness seemed to attack the GI system, neuromuscular network and autonomic system, sparing the cognitive and sensory systems. Death from the disease was ultimately through respiratory and cardiac failure secondary to muscle weakness.

• Two years later, through experimentation of this “poison”, he proposed that the toxin could be used for therapeutic purposes. He hypothesized that in small doses, the botulinum toxin could be used to treat conditions that involved hyperexcitability of the nervous system.

• In 1890 the bacterial source of the toxin was discovered after 34 people were poisoned by eating contaminated ham. It was then named using the Latin word for sausage “botulus” in reference to the “blood sausage illness” of the 1800s.
“A lot kills, a little cures” – Botulinum toxin is a key example of this pharmaceutical concept of toxicology.
Botulinum toxin is a protein produced by the spore-forming, anaerobic bacterium *Clostridium botulinum*. Spores are found in soil and marine sediment worldwide as well as in the GI tracts of some animals and humans. Botulinum neurotoxins are some of the most toxic proteins known. There are 7 different serotypes of neurotoxin (A, B, C1, D, E, F, and G). All serotypes act by binding to peripheral cholinergic terminals at the neuromuscular junction and at the autonomic post-ganglionic nerve terminals (inhibiting the release of the neurotransmitter acetylcholine).
MECHANISM OF ACTION

• Toxin composed of a heavy and a light chain

• Heavy chain binds to the receptor on the presynaptic nerve terminal and is internalized by endocytosis

• Light chain (which is actually an enzyme) then cleaves SNARE proteins, preventing the fusion of vesicles with the presynaptic membrane, thereby preventing Ach release
TARGET SNARE PROTEINS OF BOTULINUM TOXINS
CLINICAL EFFECTS

Weakens muscle, prevents contractions:
Beneficial for the treatment of specific movement disorders

Decreases secretions:
Beneficial for the treatment of sialorrhea

Possible side effects:
Injection reactions – anxiety or vasovagal episode, bruising at the site, erythema or edema at the site, infection, pain, paresthesia or dysesthesia
Allergic reaction
Antibody production against toxin
Distant spread from the injection site
Ptosis, facial asymmetry
Dysphagia
Head drop
Spread of toxin effect
• Botulinum toxin effects may be observed beyond the site of local injection.

• The symptoms are consistent with the mechanism of action of botulinum toxin and may include asthenia, generalized muscle weakness, diplopia, blurred vision, ptosis, dysphagia, dysphonia, dysarthria, urinary incontinence and breathing difficulties.

• These symptoms have been reported hours to weeks after injection.

• Swallowing and breathing difficulties can be life-threatening and there have been reports of death related to spread of toxin effects.

• The risk of symptoms is probably greatest in children treated for spasticity but symptoms can also occur in adults treated for spasticity and other conditions, particularly in those patients who have underlying conditions that would predispose them to these symptoms.
• It is estimated that approximately 20% of patients eventually stop treatment, mostly because of treatment failure.

• Poor responders (treatment failures) are those who do not achieve adequate symptom relief or who develop intolerable adverse effects from treatment.

• Primary non-responders are those in whom botulinum toxin treatment has never helped.

• Secondary non-responders are those who fail to respond following previously successful treatment to botulinum toxin. A widely accepted definition of secondary non-response is “an unsatisfactory therapeutic response to two successive injection cycles, where the patient has previously received a minimum of two successful treatment cycles”.
• Possibilities:
  
  1. Immuno-resistance
     • In the case of immuno-resistance to BoNT-A, there are different therapeutic options (BoNT-A holidays, BoNT-B injections, alternative BoNT-A injections, deep brain stimulation)

  2. Incorrect technique or dosing
     • In the case of incorrect technique – the provider can consider reviewing the injection technique with electromyography or ultrasound guidance, consider alternate muscle selection and possible increase in dose
IMMUNORESISTANCE

• Over time, patient can develop neutralizing antibodies
• Risk increases with higher doses per treatment, more frequent injections (standard 3 months or greater), longer duration of treatment
• May need to change serotype of toxin
• Can do laboratory testing but not readily available, more common to inject unilateral corrugator or frontalis muscle and re-evaluate efficacy and difference between muscles after 4 weeks
US FORMULATIONS

• Type A
  • Botox (onabotulinumtoxin A)
  • Dysport (abobotulinumtoxin A)
  • Xeomin (incobotulinumtoxin A)

• Type B
  • Myobloc (rimabotulinumtoxin B)
FDA INDICATIONS

- Chronic migraine
- Focal spasticity
- Cervical dystonia
- Blepharospasm
- Strabismus
- Overactive bladder
- Axillary hyperhidrosis
- Sialorrhea
# FDA Indications for Movement Disorders

<table>
<thead>
<tr>
<th>BoNT Preparation</th>
<th>Brand Name (Manufacturer)</th>
<th>FDA-Approved Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td>OnabotulinumtoxinA</td>
<td>Botox (Allergan, Inc., Irvine, CA)</td>
<td>Blepharospasm, CD, upper extremity spasticity, lower extremity spasticity, CM</td>
</tr>
<tr>
<td>AbobotulinumtoxinA</td>
<td>Dysport (Ipsen Ltd., Paris, France)</td>
<td>CD, upper extremity spasticity</td>
</tr>
<tr>
<td>IncobotulinumtoxinA</td>
<td>Xeomin (Merz Pharmaceuticals, Frankfurt, Germany)</td>
<td>Blepharospasm, CD, upper extremity spasticity, <strong>SIALORRHEA</strong></td>
</tr>
<tr>
<td>RimabotulinumtoxinB</td>
<td>Myobloc Neurobloc (US WorldMeds/Solstice Neurosciences, Louisville, KY)</td>
<td>CD <strong>SIALORRHEA</strong></td>
</tr>
</tbody>
</table>

Abbreviations: BoNT = botulinum neurotoxin; CD = cervical dystonia; CM = chronic migraine; FDA = Food and Drug Administration.
### Evidence-based conclusions and recommendations for the efficacy of various botulinum neurotoxin formulations by indication

<table>
<thead>
<tr>
<th>Indication</th>
<th>Level A&lt;sup&gt;a&lt;/sup&gt; effective</th>
<th>Level B&lt;sup&gt;b&lt;/sup&gt; probably effective</th>
<th>Level C&lt;sup&gt;c&lt;/sup&gt; possibly effective</th>
<th>Level U&lt;sup&gt;d&lt;/sup&gt; insufficient evidence</th>
<th>Level A&lt;sup&gt;e&lt;/sup&gt; ineffective</th>
<th>Level B&lt;sup&gt;f&lt;/sup&gt; ineffective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blepharospasm</td>
<td>AbobotulinumtoxinA, incobotulinumtoxinA</td>
<td>OnabotulinumtoxinA, incobotulinumtoxinA</td>
<td>AbobotulinumtoxinA</td>
<td>RimabotulinumtoxinB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cervical dystonia</td>
<td>AbobotulinumtoxinA, rimabotulinumtoxinB</td>
<td>OnabotulinumtoxinA, incobotulinumtoxinA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper limb spasticity&lt;sup&gt;g&lt;/sup&gt;</td>
<td>AbobotulinumtoxinA, onabotulinumtoxinA, incobotulinumtoxinA</td>
<td>OnabotulinumtoxinA, incobotulinumtoxinA</td>
<td></td>
<td>RimabotulinumtoxinB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower limb spasticity</td>
<td>OnabotulinumtoxinA, abobotulinumtoxinA</td>
<td>IncobotulinumtoxinA, rimabotulinumtoxinB</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chronic migraine</td>
<td>OnabotulinumtoxinA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Episodic migraine</td>
<td></td>
<td></td>
<td></td>
<td>OnabotulinumtoxinA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tension-type headache</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>OnabotulinumtoxinA</td>
<td></td>
</tr>
</tbody>
</table>

**Abbreviations:** aBoNT-A = abobotulinumtoxinA; iBoNT-A = incobotulinumtoxinA; oBoNT-A = onabotulinumtoxinA; rBoNT-B = rimabotulinumtoxinB.

<sup>a</sup> Level A recommendation for effectiveness signifies intervention should be offered.

<sup>b</sup> Level B recommendation for effectiveness signifies intervention should be considered.

<sup>c</sup> Level C recommendation for effectiveness signifies intervention may be considered.

<sup>d</sup> Level U recommendation signifies insufficient evidence to support or refute effectiveness of intervention.

<sup>e</sup> Level A recommendation for ineffectiveness signifies intervention should not be offered.
INJECTION TECHNIQUES

ANATOMIC GUIDANCE
ELECTRICAL STIMULATION
EMG GUIDANCE
US GUIDANCE
DYSTONIA

- Botulinum toxins are first line treatment for focal/segmental dystonias
  - Blepharospasm
  - Hemifacial spasm
  - Cervical dystonia
BLEPHAROSPASM

• Involuntary contraction of the orbicularis oculi muscle, causing frequent blinking, squinting and involuntary eye closure

• Can be triggered by bright light, wind

• Can impair daily activities of walking, reading and driving due to “functional blindness” from inability to temporarily open the eyes

• Risk factors for development include head or facial trauma, family or personal history of dystonia or movement disorder

• Reported incidence is 5 cases per million population worldwide

***Must differentiate from apraxia of eyelid opening as botulinum toxin treatment will not help these patients and may worsen eye closure***
• Treatment of choice is injection of botulinum toxin into the orbicularis oculi muscle
  • Reported side effects include ptosis (up to 20% of patients and eye dryness in 5-6% of patients)

• Oral medications such as muscle relaxants and sedatives are rarely effective in the treatment of blepharospasm. They may dampen mild symptoms or possibly prolong intervals between injections, but their side effects must be considered alongside their benefits.

• It is also important to provide symptomatic therapy for patients through artificial tears for ocular irritation, eyelid scrubs with baby shampoo to minimize any blepharitis that can also aggravate the condition and encourage patient to wear dark sunglasses to minimize bright light triggers.

• 90% of patients improve symptomatically with botulinum toxins although continued injections are necessary
BOTOX

• FDA APPROVED FOR THIS INDICATION SINCE 1989

Dosing in Blepharospasm

3 approved regions for BOTOX® in the orbicularis oculi muscle

- Medial pretarsal orbicularis oculi (upper lid): 1.25 Units to 2.5 Units
- Lateral pretarsal orbicularis oculi (upper lid): 1.25 Units to 2.5 Units
- Lateral pretarsal orbicularis oculi (lower lid): 1.25 Units to 2.5 Units

Note: These are general areas, not the specific injection sites.
Studies show equal efficacy to Botox for blepharospasm treatment

<table>
<thead>
<tr>
<th>Injection area</th>
<th>Median XEOMIN® units</th>
<th>Median number of injection sites (minimum — maximum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temporal area</td>
<td>13 units</td>
<td>2</td>
</tr>
<tr>
<td>Eyebrow area</td>
<td>5 units</td>
<td>1</td>
</tr>
<tr>
<td>Upper lid area</td>
<td>10 units</td>
<td>2</td>
</tr>
<tr>
<td>Lower lid area</td>
<td>8 units</td>
<td>2</td>
</tr>
<tr>
<td>Orbital rim</td>
<td>5 units</td>
<td>1</td>
</tr>
</tbody>
</table>
CERVICAL DYSTONIA

- Involuntary activation of muscles in the neck causing painful, abnormal posturing
  - Torticollis
  - Laterocollis
  - Anterocollis
  - Retrocollis
- Affects >100,000 people in the US
- 1.3 times more common in women than in men
- Median age of onset is 40 years
- Can be primary CD or Secondary CD:
  - Primary form most prevalent
  - Secondary due to neurologic syndromes, trauma, tumors, hemorrhage, hypoxia, infection and drug/chemical exposure
- Comparative trials indicate similar efficacy for all 4 toxins
Common postures involved in cervical dystonia

According to 1 study of 300 patients¹:

- 82% of patients
- 42% of patients
- 25% of patients
- 29% of patients

Torticollis (rotated)
Laterocollis (to the side)
Anterocollis (forward)
Retrocollis (backward)

66% of cervical dystonia patients present with a combination of postures
<table>
<thead>
<tr>
<th>Predominant Movement</th>
<th>Muscles Involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turn (torticollis)[13]</td>
<td>Ipsilateral splenius/semispinalis capitus</td>
</tr>
<tr>
<td></td>
<td>Contralateral sternocleidomastoid</td>
</tr>
<tr>
<td>Tilt (laterocollis)[13]</td>
<td>Ipsilateral sternocleidomastoid</td>
</tr>
<tr>
<td></td>
<td>Ipsilateral splenius/semispinalis capitus</td>
</tr>
<tr>
<td></td>
<td>Ipsilateral scalene complex</td>
</tr>
<tr>
<td></td>
<td>Ipsilateral levator scapulae</td>
</tr>
<tr>
<td></td>
<td>Ipsilateral posterior paravertebrals</td>
</tr>
<tr>
<td>Shoulder elevation[13]</td>
<td>Ipsilateral levator scapulae</td>
</tr>
<tr>
<td></td>
<td>Ipsilateral trapezius</td>
</tr>
<tr>
<td>Retrocollis (head tilted backwards)[13,14]</td>
<td>Bilateral splenius/semispinalis capitus</td>
</tr>
<tr>
<td></td>
<td>Bilateral upper trapezius</td>
</tr>
<tr>
<td></td>
<td>Bilateral deep posterior paravertebrals</td>
</tr>
<tr>
<td>Arterocollis (head tilted forwards)[13]</td>
<td>Bilateral sternocleidomastoid</td>
</tr>
<tr>
<td></td>
<td>Bilateral scalene complex</td>
</tr>
<tr>
<td></td>
<td>Bilateral submental complex</td>
</tr>
</tbody>
</table>
SCM:  
Ipsilateral sidebend and contralateral rotation with unilateral activation

Can add ipsilateral longissimus and levator scapulae and contralateral trapezius and anterior scalenes

Ipsilateral splenius/semispinalis capitus
Contralateral sternocleidomastoid

Semispinalis capitis and Splenius capitus:  
Ipsilateral rotation and sidebend with unilateral activation
Scalenes:
Ipsilateral sidebend with unilateral activation

Levator:
Ipsilateral sidebend

Can add ipsilateral longissimus and trapezius

Tilt (laterocollis) [13]
Retrocollis (head tilted backwards) [13, 14]

Bilateral splenius/semispinalis capitis
Bilateral upper trapezius
Bilateral deep posterior paravertebrals

Can add bilateral longissimus and levator scapulae

Trapezius:
Neck extension with bilateral activation

Semispinalis capitis and Splenius capitus:
Neck extension with bilateral activation
SCM:
Neck flexion with bilateral activation

Scalenes:
Ipsilateral sidebend with unilateral activation
• Limiting the total dose injected into the SCM of 100 units or less may decrease the occurrence of dysphagia.

• In general, no more than 50 units per site should be administered.
**Dosing by Muscle**

**XEOMIN® (120 units) initial dose by unilateral muscle**

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Number of patients injected per muscle</th>
<th>XEOMIN dose injected</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Median XEOMIN units</td>
</tr>
<tr>
<td>Sternocleidomastoid</td>
<td>63</td>
<td>25</td>
</tr>
<tr>
<td>Splenius capitis/semispinalis capitis</td>
<td>78</td>
<td>48</td>
</tr>
<tr>
<td>Trapezius</td>
<td>55</td>
<td>25</td>
</tr>
<tr>
<td>Levator scapulae</td>
<td>49</td>
<td>25</td>
</tr>
<tr>
<td>Scalenus (medius and anterior)</td>
<td>27</td>
<td>20</td>
</tr>
</tbody>
</table>

*Recommended total dose is 120 units*

- No meaningful efficacy difference between 120-unit and 240-unit treatment groups
Recommended initial dose is 500 units divided among affected muscles.
Recommended initial dose is 2,500-5,000 units divided among affected muscles.
SIALORRHEA

• Sialorrhea in PD

  • Due to poor management of secretions due to oropharyngeal dysphagia and lingual bradykinesia, inability to maintain saliva in mouth due to stooped posture and hypomimia (mouth open at rest)

  • No real increase in basal production of saliva
Guidelines for locating salivary glands using anatomical landmarks:

1. To inject the parotid gland, bisect the distance between the tip of the tragus (Site A) and the angle of the mandible (Site B). Inject one finger breadth anterior to this site (Injection Site 1).

2. To inject the submandibular gland, bisect the distance between the angle of the mandible (Site B) and the tip of the chin (Site C). Inject one finger breadth medial to the inferior surface of the point of bisection (Injection Site 2).

<table>
<thead>
<tr>
<th>Gland(s)</th>
<th>Units Per Side</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parotid gland(s)</td>
<td>30 Units</td>
<td>60 Units</td>
</tr>
<tr>
<td>Submandibular gland(s)</td>
<td>20 Units</td>
<td>40 Units</td>
</tr>
<tr>
<td>Both gland(s)</td>
<td>50 Units</td>
<td>100 Units</td>
</tr>
</tbody>
</table>
Guidelines for locating salivary glands using anatomical landmarks:

1. To inject the parotid gland, bisect the distance between the tip of the tragus (Site A) and the angle of the mandible (Site B). Inject one finger breadth anterior to this site (Injection Site 1).

2. To inject the submandibular gland, bisect the distance between the angle of the mandible (Site B) and the tip of the chin (Site C). Inject one finger breadth medial to the inferior surface of the point of bisection (Injection Site 2).

<table>
<thead>
<tr>
<th>Gland</th>
<th>Recommended Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parotid</td>
<td>500 Units to 1,500 Units per gland</td>
</tr>
<tr>
<td>Submandibular</td>
<td>250 Units per gland</td>
</tr>
</tbody>
</table>
TREMOR – OFF LABEL USE

• Botulinum toxins may be useful in treating some types of tremors – especially head and voice tremors

• 2018 retrospective review of database of patients treated with onabotulinumtoxin A (Botox) for hand tremor (Niemann and Jankovic - Toxins July 2018)
  • 91 patients = 53 ET, 31 dystonic tremor, 6 PD and 1 cerebellar tremor
  • 80% of patients reported marked improvement
<table>
<thead>
<tr>
<th>Treatment Indication (Muscles Injected/Limbs Injected)</th>
<th>ET</th>
<th>PD</th>
<th>Dystonia</th>
<th>COT</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deltoid</td>
<td>0/99</td>
<td>0/6</td>
<td>1/37</td>
<td>1/1</td>
<td>2/143</td>
</tr>
<tr>
<td>Biceps</td>
<td>10/99</td>
<td>0/6</td>
<td>3/37</td>
<td>1/1</td>
<td>14/143</td>
</tr>
<tr>
<td>Triceps</td>
<td>1/99</td>
<td>0/6</td>
<td>0/37</td>
<td>0/1</td>
<td>1/143</td>
</tr>
<tr>
<td>Pronator teres</td>
<td>4/99</td>
<td>0/6</td>
<td>5/37</td>
<td>0/1</td>
<td>9/143</td>
</tr>
<tr>
<td>FCU</td>
<td>94/99</td>
<td>6/6</td>
<td>34/37</td>
<td>1/1</td>
<td>135/143</td>
</tr>
<tr>
<td>FCR</td>
<td>92/99</td>
<td>6/6</td>
<td>26/37</td>
<td>1/1</td>
<td>125/143</td>
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<tr>
<td>FDS</td>
<td>3/99</td>
<td>0/6</td>
<td>4/37</td>
<td>0/1</td>
<td>7/143</td>
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<tr>
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<td>APB</td>
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<td>0/6</td>
<td>11/37</td>
<td>0/1</td>
<td>12/143</td>
</tr>
<tr>
<td>ED</td>
<td>0/99</td>
<td>0/6</td>
<td>1/37</td>
<td>0/1</td>
<td>1/143</td>
</tr>
<tr>
<td>EPB</td>
<td>0/99</td>
<td>0/6</td>
<td>1/37</td>
<td>0/1</td>
<td>1/143</td>
</tr>
<tr>
<td>UNS extensor</td>
<td>0/99</td>
<td>0/6</td>
<td>1/37</td>
<td>0/1</td>
<td>1/143</td>
</tr>
</tbody>
</table>

- ET = Essential tremor, PD = Parkinson's disease, COT = Cerebellar outflow tremor, FCU = Flexor carpi ulnaris, FCR = Flexor carpi radialis, FDS = Flexor digitorum superficialis, ADM = Abductor digiti minimi, APB = Abductor pollicis brevis, ED = extensor digitorum, EPB = Extensor pollicis brevis, UNS extensor = unspecified extensor muscle.
DILUTION TABLES
### BOTOX

<table>
<thead>
<tr>
<th>Diluent* Added to 100 Unit Vial</th>
<th>Resulting Dose Units per 0.1 mL</th>
<th>Diluent* Added to 200 Unit Vial</th>
<th>Resulting Dose Units per 0.1 mL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 mL</td>
<td>10 Units</td>
<td>1 mL</td>
<td>20 Units</td>
</tr>
<tr>
<td>2 mL</td>
<td>5 Units</td>
<td>2 mL</td>
<td>10 Units</td>
</tr>
<tr>
<td>4 mL</td>
<td>2.5 Units</td>
<td>4 mL</td>
<td>5 Units</td>
</tr>
<tr>
<td>8 mL</td>
<td>1.25 Units</td>
<td>8 mL</td>
<td>2.5 Units</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 mL</td>
<td>2 Units</td>
</tr>
</tbody>
</table>
DYSPORT

Dysport 500-Unit Vial  |  2.5 mL of Diluent*  |  Resulting Dose
                      |  Dysport           |  20 Units/0.1 mL

Dysport 300-Unit Vial  |  1.5 mL of Diluent*  |  Resulting Dose
                      |  Dysport           |  20 Units/0.1 mL
### Diluent volumes for XEOMIN reconstitution

<table>
<thead>
<tr>
<th>Volume of preservative-free 0.9% sodium chloride</th>
<th>50-unit vial: Resulting dose in units per 0.1 mL</th>
<th>100-unit vial: Resulting dose in units per 0.1 mL</th>
<th>200-unit vial: Resulting dose in units per 0.1 mL</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.25 mL</td>
<td>20 units</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>0.5 mL</td>
<td>10 units</td>
<td>20 units</td>
<td>40 units</td>
</tr>
<tr>
<td>1 mL</td>
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<td>4 mL</td>
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<tr>
<td>5 mL</td>
<td>1 unit</td>
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</tbody>
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MYOBLOC

2,500 units in 0.5 ml

5,000 units in 1 ml

10,000 units in 2 ml

3 SINGLE-DOSE VIAL SIZES

Ready to use, no mixing/dilution required
CASE REVIEW
QUESTION 1:

• 65 y.o. male with Parkinson’s disease and moderate dementia presents to the Neurologist with complaint of worsening sialorrhea. What would be the best treatment options to consider for this patient?
  • 1. Anticholinergic medications (glycopyrrolate or scopolamine)
  • 2. Behavior modification (cueing, encouraging water, candies, gum)
  • 3. Botulinum toxin injections
  • 4. Muscle relaxant medication (baclofen or cyclobenzaprine)
ANSWER:

• 2. Behavior modification (cueing, encouraging water, candies, gum)
• 3. Botulinum toxin injections (Xeomin and Myobloc are both FDA indicated for sialorrhea)
QUESTION 2:

• 56 y.o. female with cervical dystonia who has been receiving botulinum toxin injections with reported benefit for the past 18 months presents to the office stating that she did not get a benefit from her last injection. What type of non-responder is she?

  • 1. Primary non-responder
  • 2. Secondary non-responder
  • 3. Tertiary non-responder
ANSWER

• 2. Secondary non-responder

  • Secondary non-responders are those who fail to respond following previously successful treatment to botulinum toxin. A widely accepted definition of secondary non-response is “an unsatisfactory therapeutic response to two successive injection cycles, where the patient has previously received a minimum of two successful treatment cycles”.

QUESTION 3:

• What may have caused this poor response to her last injection?
  • A. Development of immunoresistance to the toxin
  • B. Inadequate targeting of the proper muscles to inject
  • C. Need to increase dose of toxin given
  • D. All of the above
D. All of the above