CE

Core Curriculum for Plastic Surgical Nursing

Botulinum Toxin Type A for Facial Aesthetics

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PURPOSE

The patient's desire for aesthetic changes with minimal downtime and recovery has fueled nonsurgical intervention popularity for facial rejuvenation. Botulinum toxin type A, one of the seven neurotoxins found in *Clostridium botulinum*, was first isolated in 1946. Its uses for medical intervention in blepharospasm and strabismus began in 1976. FDA approval for these areas came in 1989. Cosmetic improvements were noted as a side effect of botulinum toxin type A for medical treatments and aesthetic trials were started. Food and Drug Administration (FDA) approval for the glabellar frown lines came in 2003, and many off label uses for facial wrinkle reduction and sculpting emerged. Botulinum toxin type A is now widely used for nonsurgical treatment of facial wrinkling, sagging, and asymmetries and remains the most commonly performed aesthetic procedure. Achieving superior outcomes with patient satisfaction is the ultimate goal.

OBJECTIVES

On completion of this section, the learner will be able to

1. Describe the function of the target muscles and opposing muscles when assessing a patient for a botulinum toxin treatment.
2. List the FDA approved and off-label indications for a botulinum toxin treatment.
3. Explain the mechanism of action that produces the chemical denervation of the muscle.
4. Identify the contraindications of a botulinum toxin treatment.
5. Identify the important components of a patient consultation and assessment prior to a botulinum treatment.
6. Identify the important components of the treatment process to ensure a superior outcome.
7. Identify the potential complications that may arise from a botulinum toxin treatment.

CONTENT OUTLINE

I. Facial Anatomy

A. Frontalis

1. Quadrilateral muscle that originates from the galea in the hairline and inserts inferiorly into the procerus, orbicularis oculi, corrugator supercilli, depressor supercilli, and the skin of the brow contraction produces a series of transverse brow wrinkles, raises the eyebrows and skin over the root of the nose, and draws the scalp forward.

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The author has no conflict of interest.

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B. Corrugator supercilli
   1. Muscle arises from the periosteum, along the superior medial orbital rim, and inserts into the skin of the medial brow.
   2. These muscles are intertwined with the orbicularis oculi.
   3. Contraction pulls the brows medially, producing vertical wrinkling.

C. Procerus
   1. Muscle arises from the upper lateral cartilage of the nasal bones and inserts into the glabellar skin at the medial edge of the frontalis.
   2. Muscle intertwines with the orbicularis oculi and depressor supercilli muscles.
   3. Contraction draws the medial angle of the eyebrows down and causes transverse wrinkling of the radix of the nose.

D. Depressor supercilli
   1. Muscle lies underneath and is intertwined with the procerus.
   2. Contraction pulls down the brows.

E. Orbicularis oculi
   1. This muscle surrounds the eye.
   2. Contraction at the medial angle causes medial brow depression (along with the procerus and depressor supercilli).
   3. Contraction at the lateral angles of the eyelids causes canthal wrinkles or "crow's feet."

F. Levator Mueller's muscle
   1. Muscle inserts superficially in the mid-pupillary region just below the orbital ridge.
   2. Raises the upper eyelid.

G. Nasalis
   1. Muscle runs inferiorly from the dorsum of the nose.
   2. Contraction produces vertical/oblique lines on each side of the dorsum and vertically on the dorsum.
   3. Called "bunny lines" in women and "wolf lines" in men.

H. Levator labi superioris alaque nasi
   1. This muscle raises the upper lip.

I. Levator labi
   1. This muscle raises the upper lip
   2. Not usually injected with botulinum toxin type A.

J. Zygomaticus minor and major
   1. This muscle raises the corners of the mouth.
   2. Gives the ability to smile.

K. Orbicularis oris
   1. Sphincter muscle surrounds the mouth and is responsible for allowing the lips to close and pucker.
   2. Overactive orbicularis oris contributes to the appearance of "smoker" or "lipstick" lines.

L. Depressor anguli oris
   1. Muscle at the lower corners of the mouth and inserts into the mandible.
   2. Overactive depressor anguli oris causes the lip corners to be pulled down, resulting in "marionette lines" or an angry look.

M. Depressor septi
   1. Muscle at the base of the columella.
   2. Causes a horizontal line of the central upper lip.
   3. Pulls nasal tip downward.

N. Platysma
   1. Muscle arises from the pectoralis major and the deltoid, stretches across the clavicle and upward below the mandible.
   2. Contraction causes vertical neck bands and or horizontal neck lines.

II. Indications

A. Aesthetic use—including but not limited to
   1. FDA approved aesthetic uses
      a. Glabellar frown lines
      b. Axillary hyperhidrosis
   2. "Off-label" use for wrinkle reduction and elimination*
      a. Facial asymmetry or defect
      b. Transverse forehead lines
      c. Peri-orbital rhytids (crow's feet)
      d. Oblique nasal lines (bunny/wolf lines)
      e. Peri-oral lip lines (smoker's lines)
      f. Oblique chin lines
      g. Mental crease
      h. Platysmal bands
      i. Horizontal neck lines
   3. "Off-label" use for facial sculpting*
      a. Chemical brow lift
      b. Elevation of the nasal tip
      c. Turn up corners of mouth
      d. Softening of mental crease
      e. Softening of dimply chin
      f. Eversion of lips
      g. Improvement/correction of a "gummy" smile

B. Medical use—including but not limited to
   1. FDA approved medical uses
      a. Blepharospasm
      b. Strabismus
      c. VII nerve disorders
      d. Cervical dystonia
      e. Axillary hyperhydrosis

*In the United States, a licensed physician can legally prescribe any FDA approved medication to benefit a patient in any way.

2. "Off-label" medical uses*
   a. Hyperhydrosis of the palms and soles of the feet
   b. Spasticity
   c. Migraine headaches
   d. Facial asymmetry due to nerve injury

III. Mechanism of Action

A. Blocks neuromuscular transmission by binding to acceptor sites on motor nerve terminals and inhibiting the release (not the production) of acetylcholine.
B. Produces temporary chemical denervation of the muscle by interrupting the communication of the nerve and muscle, resulting in localized reduction of muscle activity.
C. Effects of treatment with botulinum toxin type A are evident between 3 and 7 days.
D. Results may last from 2 to 4 months and are somewhat dependent on the dosage according to muscle bulk and skin thickness rather than the volume injected.

IV. Contraindications

A. Known hypersensitivity to any ingredient of the botulinum toxin type A compound including sodium chloride and human albumin.
B. Active acne or herpes simplex at or near the injection site(s).
C. Pregnancy, although inadvertent administration of botulinum toxin type A has not caused any adverse response or pregnancy complication.
D. Cautious use in patients with known peripheral motor neuropathic disease (i.e., amyotrophic lateral sclerosis) or a neuromuscular junction disorder (i.e., myasthenia gravis or Eaton-Lambert syndrome).

   1. No long-term adverse health effects or health hazards have been found related to Botox® Cosmetic.

V. How Supplied, Dilution, and Handling

(This information is limited to the most widely available and used product, Botox Cosmetic, Allergan, Inc., Irvine, CA. There are most certainly products being developed by other manufacturers soon to be available in the marketplace.)

Clostridium botulinum toxin type A (Botox Cosmetic) is supplied in a vial containing 100 U of vacuum-dried powder neurotoxin complex.

A. The Botox Cosmetic package insert recommends

   1. Reconstitution with nonpreserved 0.9% saline.
   2. 2.5 ml of diluent per 100 U vial (4 U/0.l ml).
   3. Avoiding agitation or introduction of air into vial.
   4. Use of botulinum toxin should be used within 4 hr of dilution.
   5. Storage at 2°C to 8° C before reconstitution for up to 24 months.
   6. Storage at 2°C to 8°C after reconstitution for up to 4 hr.
   7. Using a tuberculin syringe for injection.
   8. No recommendation for the use of topical anesthetics.

B. According to the Consensus Recommendations on the Use of Botulinum Toxin Type A in Facial Aesthetics (Carruthers, Fagien, Matarasso, & the Botox Consensus Group, 2004)

   1. Reconstitution with preserved 0.9% saline.
      a. Resulting in decreased pain being reported by patients.
      b. No decreased efficacy of the product.
   2. Any convenient concentration to deliver required units per injection site.
   3. Agitation of reconstituted botulinum toxin does not decrease its efficacy.
   4. Botulinum toxin can be stored up to 6 weeks without decreased efficacy.
   5. Recommends referring to the approved package insert before using Botox Cosmetic.
   6. Recognizes the use of a tuberculin or insulin syringe to be practitioner preference.
   7. Recommends a 30- or 32-gauge needle per practitioner preference.
   8. Topical anesthetics and/or the use of ice could be beneficial to decrease discomfort for some patients

VI. Patient Consultation and Assessment (Table 1)

A. Review detailed medical history for discovery of possible contraindications.
B. Identify patient expectations and priorities.
C. Explain mechanism of action, onset of action, and longevity of results.

TABLE 1 Based on Glogau's Wrinkle Scale

Type I: Very fine or no lines present
1. Expect elimination of lines with botulinum toxin type A injections
Type II: Lines only present with animation (eliminate with stretch)
2. Expect elimination of lines
Type III: Lines present while at rest (almost eliminated with stretch)
3. Expect probable elimination of lines with treatment
Type IV: Generalized lines (lines present with stretch)
4. Need adjunctive treatment (e.g., dermal fillers, peels, laser) for elimination of lines

TABLE 2 Targeted Muscles and Typical Dosages

Treatment areas	Targeted muscles	Total dosage
Horizontal forehead rhytids	Frontalis	Women: 10–20 units Men: 20–30 units
Glabellar complex[a]	Procerus Medial and lateral corrugators Depressor supercilli[b]	 Women: 20–30 units Men: 30–40 units
Peri-ocular rhytids (crow's feet)	Orbicularis oculi (lateral)	12–30 units
Lateral brow lift	Vertical fibers—orbicularis oculi	3–7 units per side 6–12 units total
Medial brow lift	Procerus	7–12 units
Bunny or wolf lines	Nasalis procerus (for transverse line—dorsum)	2–4 units per side 4–8 units total 1 unit, if needed
Nasal tip droop Horizontal line upper lip	Depressor septi	2 units
Peri-oral rhytids	Orbicularis oris	4–10 units divided
Down turned mouth	Depressor anguli oris	3–7 units per side 6–14 units total
Dimpled chin Mental crease	Mentalis	Women: 2—6 units Men: 2—8 units
Platysmal bands	Platysma	10–20 units per band
Horizontal neck rhytids	Intra-dermal Platysma by dispersement	10–20 units per line
Hyperhydrosis of axillae,[a] palms and soles		50—100 units per area

[a]FDA approved area.
[b]Receives botulinum toxin type A through dispersement from procerus and corrugator injections.

TABLE 3 Site-Specific Complications (Not Limited to Those Listed in the Table Body)

Site	Complication	Cause
Frontalis (transverse forehead lines)	Brow heaviness or ptosis	
Glabellar complex (frown lines or brow lift)	Eyelid ptosis	Migration of injection into the orbital septi or onto the levator muscle
Peri-orbital rhytids (crow's feet)	Diplopia	Migration of injection onto the lateral rectus muscle
	Ectropion	Weakness of orbicularis oculi
	Smile asymmetry	Inadvertent injection or insertion of zygomaticus minor or major
Orbicularis oculi (hypertrophied orbicularis oculi)	Ectropion	Secondary to migration to the lateral rectus muscle
	Dry eyes	Increased exposure of the eye
	Malar edema	Weakened orbicularis oculi
	Scleral show	Weakened orbicularis oculi
Nasalis (bunny/wolf lines)	Asymmetric smile	Migration onto the levator labi superioris alaque nasi
Depressor septi (nasal tip droop)	Inability to raise upper lip	Migration onto orbicularis oris
Depressor anguli oris (turned down mouth)	Inability to lower bottom lip	Migration of injection or inadvertent injection of the depressor labi
Orbicularis oris (vertical lip lines)	Asymmetric smile	Uneven dispersement of injection
Platysma (bands or neck lines)	Dysphagia	Excessive dosage
	Dystonia	
	Weakness of neck flexors	

TABLE 4 **State Regulations Regarding RN Injectors**

State	Yes	No	No position, follow decision-making tree	With proper education documented	ARNP only	Statement
Alabama		X				Injection of Botox is the practice of medicine, State Board of Medicine
Arizona			X	X		
Arkansas			X	X		
California	X			X		Botox considered a dangerous drug and there must be a good faith examination prior to prescription
Colorado			X	X		
Connecticut	X			X		In scope of TN and ARNP, MD does not need to be on site, but does need to be available for consultation
Florida			X		X	Mixed messages, BOM states that only a physician, PA, or an NP can perform, BON makesno statement
Georgia	X			X		
Hawaii			X			In past it has been opined that only ARNPs should inject
Indiana			X			
Iowa			X	X		
Kansas	X			X		LPN or RN, with specific order from physician
Kentucky			X	X		
Louisiana					X	Is within the scope of practice for an APRN to administer Botox and collagen provided the APRN is in a collaborative practice with a physician
Maine			X			Has not yet been addressed by the board
Maryland		X				*Not* within scope of TN or LPN under any circumstance
Minnesota	X			X		
Mississippi		X				*Not* within scope of RN, need to investigate if ARNP can inject
Missouri			X			
Nevada	X			X		Policies/protocols in place—not in scope of LPN
New Hampshire		X				August 2001—ruled it is not within the scope of practice for RNs to inject Botox
North Carolina	X			X		
Ohio		X				Botox is the practice of medicine and surgery and cannot be injected by an RN, including APRN
Pennsylvania			X	X		
South Carolina					X	*Not* in the scope of practice for RN unless recognized as an APRN
South Dakota	X			X		Within the scope of nursing if there is proper training
Virginia			X	X		
Washington	X			X		Within the scope of practice for RN and LPN if competent to perform procedure and protocols in place
West Virginia			X	X		The board has previously established that RNs could not inject a paralytic person without an established airway
Wyoming		X				
Nebraska			X			Several derm procedures being discussed, but no advisory opinion yet
Montana	X			X		Only under the on-site supervision of the physician
New York	X			X		Patient must be assessed by physician and RN must have prescriptive order from a physician stating exactly where and how
New Jersey	X			X		ARNPs can inject/RNs follow decision-making tree

Note. All RNs should check with their individual state board of nursing and the documented scope of practice in that state. When no specific documentation is available, most states will have an RN "decision-making tree" for further reference.

D. Document, photograph, and review any facial asymmetry with the patient.
E. Location of wrinkles or lines determines the muscles to be injected.
F. Strength of muscles and depth of lines determines dosage to deliver.
G. Document patient examination with standardized photos (at rest and in animation).
H. Have patient sign consent for use of medical photographs.
I. Have patient sign informed consent for injection with botulinum toxin type A.
J. Review postinjection instruction with patient.
K. Design customized treatment plan for patient concerns.
L. Demonstrate expected results with patient using a stretch test.

1. For wrinkle reduction.

   Examine patient at rest and during animation to identify
   a. asymmetries.
   b. strength of muscles (for dosage considerations).
   c. depth of lines (to indicate anticipated correction).

2. For facial sculpting.

   Examine patient at rest and during animation to identify
   a. asymmetries.
   b. brow height and symmetry.
   c. repeated facial expressions.

      1. continuous elevation of the eyebrows.
      2. pulling down of the corners of the mouth.
      3. repeated puckering.

VII. Injection Sites and Typical Dosages (Table 2)

A. Develop individualized treatment plan outlining patient's and practitioner's understood aesthetic goals.
B. Facial shaping and balance versus isolated wrinkle removal.

1. Goal should be to achieve facial balance.

C. Dosage dependent on skin thickness and muscle intensity.

1. Thicker skin = higher dosage.
2. Larger muscle = higher dosage.
3. Males usually require higher dose.

D. Injection sites are dependent on facial animation and anatomic variation.

VIII. Treatment Process

A. Have patient in an upright/slightly reclined position.
B. Use ice at the anticipated injection sites for anesthetic purposes and/or vasoconstriction.
C. Use topical anesthetic on sensitive areas if preferred.
D. Cleanse proposed treatment area with alcohol.
E. Mark injection sites if preferred.
F. Inject projected unit dosage into each site.
   1. Some sites are injected intramuscularly, whereas others intradermally.
   2. Massage of injected areas is dependent on the area treated.

G. Cleanse injection sites as needed.
H. Again, review postinjection instructions with patient.

1. Typical postinjection instructions
   a. Contract injected sites several times for 1 hr postinjection (helps to work the botulinum toxin type A into the treated area).
   b. Do not massage the treated area for 4 hr postinjection (minimizes migration of botulinum toxin type A).
   c. Keep head elevated above the heart for 4 hr postinjection (minimizes migration).
   d. Do not wear tight-fitting headwear for the rest of the day (could cause migration).
   e. Return to office for assessment 2 weeks postinjection (postinjection photographs at this time, assess need for touch-up injections).

I. Document injection sites, units per site and total number of units.

1. For ease of duplication or titration at subsequent visits.

IX. Complications (Table 3)

A. Very few complications have been associated with the aesthetic use of botulinum toxin type A and are categorized as

1. Temporary.
2. Inconvenient.

X. State Regulations Regarding RN Injectors (Table 4)

REFERENCE

Carruthers, J., Fagien, S., Matarasso, S. L., & the Botox Consensus Group. (2004). Consensus recommendations on the use of botulinum toxin type A in facial aesthetics. *Plastic and Reconstructive Surgery, 114*(6, Suppl.), 1S–22S.

SUGGESTED READING

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