

Botox[®]: Beauty and Beyond



Betsé Edguer, MD, FRCPC

Presented at the University of Alberta, April 2006

Botulinum toxin is a potent neurotoxin that was first identified in 1895 as the causative agent in fatal food poisoning. It is produced by the bacterium *clostridium botulinum*. Botulinum prevents exocytosis of acetylcholine from presynaptic vesicles and thereby chemically denervates muscles. Acetylcholine is required for muscle contraction at the neuromuscular junction. Paralysis is caused by blocking acetylcholine. Therapeutic benefit may be obtained by exploiting the pharmacological properties of this neurotoxin by careful administration.

Although the cosmetic injection to reduce facial wrinkles is likely the most familiar application of Botox[®], it was first used in the early 1980s for the treatment of strabismus.



Although the cosmetic injection to reduce facial wrinkles is likely the most familiar application of Botox[®], it was first used in the early 1980s

Amy's case

Amy, 41, has had migraine headaches since the age of 14. Initially, her headaches occurred once a week and lasted for several days. She had a good response to a combination of triptans and non-steroidal anti-inflammatory drugs. Over a period of two years, her headaches increased in frequency, occurring almost daily. She now has bad headaches one-third of the time. Amy uses medications 15 times to 20 times per month.

What should you consider?

Episodic migraines, such as Amy's can become chronic. Risk factors include:

- female gender,
- medication overuse and
- frequent headache attacks.

Unfortunately, treatment options for chronic migraine headaches are limited. Recently, Botox[®] treatments have been shown to be effective in helping such individuals.

How should Amy be treated?

Amy has 100 units of Botox[®] injected into her:

- procerus,
- corrugator,
- frontalis and
- temporalis muscles.

At the end of three months, she is able to reduce her headache medication usage by 50% and her headaches are significantly better.

For another case, go to page 82.

Gail's case

Gail, 45, has a history of subarachnoid hemorrhage that left her with right hemiplegia and spasticity. She tried numerous medical interventions and stretching exercises for spasticity. Over a period of time, she developed flexion of her fingers causing discomfort and making it a challenge to keep her hand clean.

Treatment

Gail receives 60 units of Botox[®] under electromyographic guidance to the flexor muscles of her hand. This results in her ability to open her hand. This improves her hand hygiene and relieves her pain.

for the treatment of strabismus. There are seven serotypes of botulinum (Type A through Type G). Botox[®] (Type A) is the most widely-investigated and clinically-used serotype. It is a versatile toxin used in the treatment of:

- muscle hyperactivity disorders,
- autonomic nervous system disorders and
- pain disorders.

Muscle hyperactivity disorders

Botox[®] reduces muscle hyperactivity, leading to functional improvement and pain reduction in the following areas:

- spasticity,
- spasm and
- movement disorders, which include:
 - Cervical dystonia
 - Tremors and tics
 - Blepharospasm
 - Spasmodic dysphonia

Dr. Edguer is a Neurologist in private practice. She is also Consultant Staff at the Royal Alexandria Hospital and Alberta Hospital Edmonton, Edmonton, Alberta.

Frequently Asked Questions

1. Is Botox[®] safe?

Flu-like syndrome has been reported. This is generally short-lived. Weakness can occur in undesired areas if Botox[®] leaks into other muscles. Despite fear related to the side-effects, reports of significant adverse events are extremely rare. The long-term effect of this treatment has not been fully determined.

2. When can a benefit be expected?

The beneficial effect starts one week after the injection, with further improvement noted over a period of one month.

3. How long is it effective?

Benefits last approximately three months. Injections should be repeated every three months.

4. Is there a problem with frequent (less than three months) injections ?

Antibody formation can occur with frequent injections, which would make the treatment ineffective.

5. Are there contraindications?

Botox[®] should not be used:

- during pregnancy,
- while breastfeeding,
- in individuals with myasthenia gravis, or
- with Eaton-Lambert syndrome.

Effects of Botox[®] may be increased with the use of aminoglycosides. Presence of infection at the proposed site is also a contraindication.

Autonomic nervous system disorders

Botox[®] blocks the release of acetylcholine in motor neurons, as well as in autonomic neurons. Autonomic neurons innervate exocrine glands, such as:

- sweat glands,
- salivary glands and

- smooth muscles (*i.e.*, GI and urogenital sphincters).
- Botox® also successfully treats the following:
- hypersecretory disorders like:
 - Hyperhidrosis
 - Sialorrhea
 - Disorders of lacrimation
 - smooth muscle disorders, such as:
 - Achalasia
 - Sphincter of Oddi dysfunction
 - Spastic constipation
 - Anal fissures

Botox® is the most widely-investigated and clinically-used serotype. It is a versatile toxin used in the treatment of muscle hyperactivity disorders, autonomic nervous system disorders and pain disorders.

Pain disorders

The use of Botox® in pain management is a relatively new area of application. Botox®, in addition to acetylcholine, reduces the release of:

- glutamate,
- substance P and
- calcitonin gene-related neuropeptide.

These are involved in neurogenic inflammation and in nociception. The following conditions respond well to treatment with Botox®:

Take-home message

- Botox® is a potent biological toxin. It blocks acetylcholine causing impaired autonomic and neuromuscular transmission. Although its widest application is still the treatment of disorders manifested by abnormal, excessive or inappropriate muscle contractions, its use has expanded to include the following disorders:
 - ophthalmologic,
 - GI,
 - urological,
 - orthopedic and
 - dermatological
- Most recently, it has been effectively used in treating musculoskeletal and pain disorders. Botox® has a direct antinociceptive effect in addition to muscle tone reduction
- It is relatively safe

- Headache
- Myofascial pain
- Temporomandibular joint disorders
- Back and neck pain

Botox® injection technique

Dosing must be tailored for the individual patient and the muscles which are to be injected. Multiple injection sites allow the toxin to have more uniform contact with the innervating areas of the muscle. The optimal number of injection sites depends on the size of the muscle. However, there are no accepted guidelines. Some muscles, such as the hand muscles, require to be injected under electromyography guidance. **Dx**