



Bahman Jabbari

Botulinum Toxin Treatment

What Everyone Should Know

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Bahman Jabbari
Emeritus Professor of Neurology
Yale University School of Medicine
New Haven, CT, USA

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Fig. 3.1 Four FDA approved botulinum toxins, three type A (Botox, Xeomin, Dysport) and one type B (Myobloc). From Chen and Dashtipour 2013 [1] - With permission from Publisher (Wiley and Sons)

Table 3.1 Six commonly used botulinum toxins -Trade name, generic name, manufacturer, FDA status

Trade name	Proprietary name	Abreviation	Manuacturer	FDA approved
Botox	onabotulinumtoxinA	onaBoNT-A or onaA	Allergan -Inc	Yes
Xeomin	incobotulinumtoxinA	incoBoNT-A or incoA	Merz Pharmaceutical	Yes
Dysport	abobotulinumtoxinA	aboBoNT-A or aboA	Ipsen pharmaceutical	Yes
Myobloc ^a	rimabotulinumtoxinB	rimaBoNT-B or rimaB	US WorldMed-Solstice	Yes
Proscine	–	Type A	Lanzhou Institute, China	No
Meditoxin (inotox)	–	Type A	Medytox South Korea	No

^aMarketed as Neurobloc in Europe, BoNT: botulinumneurotoxin

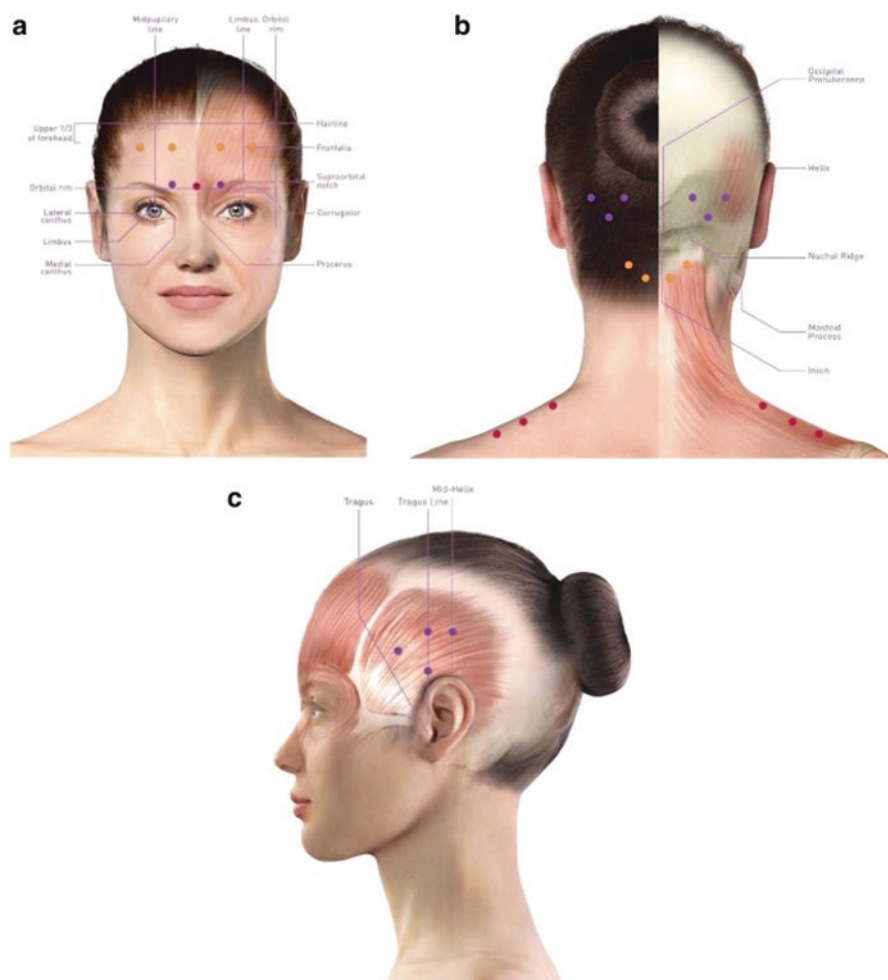


Fig. 4.1 Sites of Botox injections for treatment of chronic migraine as recommended by the PREEMPT Study group. From Blumenfeld et al. 2017 [15]. In *Headaches*. With permission from the Publisher, Wiley & Sons

How to Inject?

Botox comes in small vials with the active powdered ingredient sitting at the bottom of the vial. Botox has to be diluted with normal saline before injection. Some injectors like to add 1 cc and some add 2 cc of normal saline into the Botox vial containing 100 units of the toxin. This author prefers 1 cc dilution which allows injecting smaller volumes per site. After adding saline into the Botox vial, the solution is shaken gently and then is drawn into a small, thin 1 cc syringe with 10 divisions each representing 0.1 cc. When using 1 cc dilution, each 0.1 cc division of the

confused sometimes with low back pain due to a disc radiating to the thigh or with sciatica resulting from the irritation of the sciatic nerve further down in the thigh.

Botox injection into piriformis muscle has been shown to improve pain resulting from the piriformis syndrome. The largest placebo control study was conducted by Fishman and co-workers who compared the results of Botox, lidocaine and placebo injections into the piriformis of patients with PS. Pain relief was noted in 67%, 32% and 6% of the three groups respectively [22]. The technique of injection is laborious and needs to be performed under electromyographic guidance, to ensure proper insertion of the injecting needle. Electromyography records the electrical activity of the muscle, and in case of piriformis syndrome often demonstrates abnormal muscle activity. For injection, a special hollow needle is used that both records the muscle activity and allows injection of botulinum toxin through its core. Unlike for most indications of botulinum toxin therapy which utilize a short needle ($\frac{3}{4}$ to 1 inch), a long needle, 4.5 to 5 inch, is needed for injections in PS in order to reach the deeply located piriformis muscle (Fig. 5.8).

There are several other pain syndromes in which there is scientific evidence for efficacy of botulinum toxin therapy. These include pain in arthritis, pain associated with peripheral nerve or spinal cord trauma, muscle pain associated with stroke, bladder and pelvic pain and pain associated with certain childhood surgeries. These areas will be discussed in the succeeding chapters of this book in relation to different diseases.



Fig. 5.8 Technique of botulinum toxin injection into the piriformis muscle. Michel and co-workers 2013- Reproduced with permission from the publisher Elsevier Masson SAS

Fig. 8.1 Kidney's, ureters, bladder and urethra. From Wikibooks

Components of the Urinary System

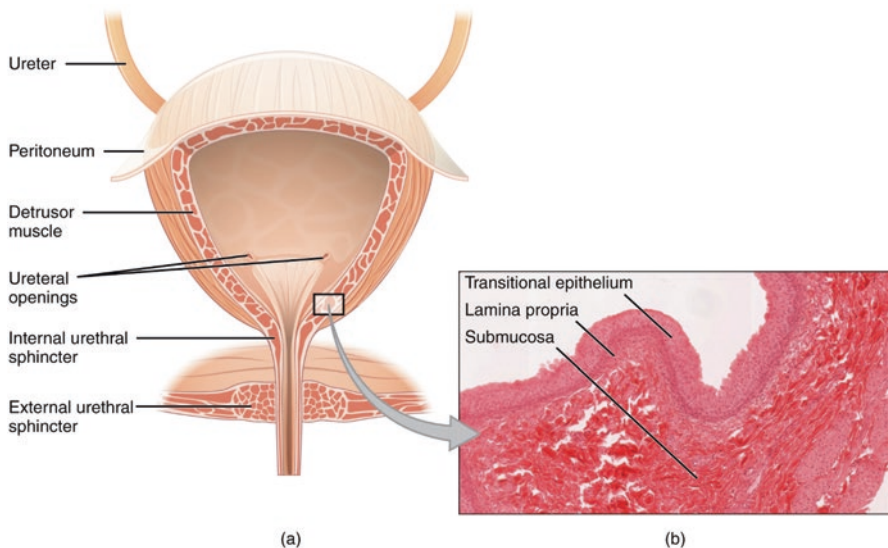
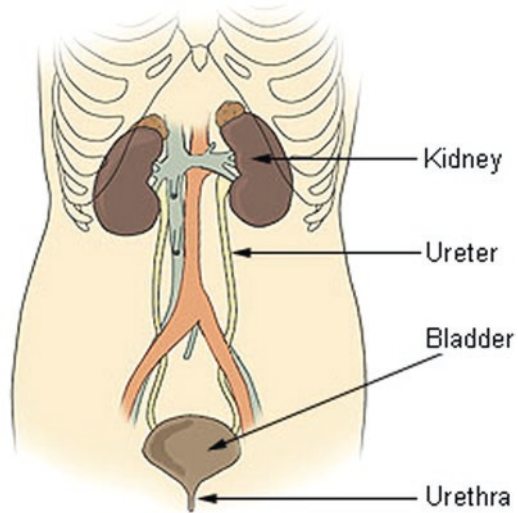


Fig. 8.2 Bladder: base, trigone, detrusor muscle, internal and external sphincters. From https://upload.wikimedia.org/wikipedia/commons/d/dc/2605_The_Bladder.jpg

2. Internal urinary sphincter: This small muscle which is around the neck of the bladder contracts during urine storage and relaxes during micturition letting the urine out of the bladder.
3. External urinary sphincter: this sphincter is located further down on the path of urine drainage, and its function is similar to that of the internal sphincter. However, it is under voluntary control.

Focal Dystonias

A– Focal Dystonias of the Face Region

The two most frequent dystonias of the face which respond to botulinum toxin therapy are blepharospasm and mouth-jaw (oromandibular) dystonias.

1-Blepharospasm

Blepharospasm is uncontrolled, tonic contraction of the muscles (orbicularis oculi/ OO) that close the eyelids (Fig. 11.1a) [1]. Spasm of these thin muscles, which are barely under the skin, forces the eyes to close.

Blepharospasm is almost always bilateral and affects both eyes. The eye lid spasms are frequent and can occur hundreds of times per day. Many patients are unable to drive a motor vehicle due to impaired vision. In over 90% of patients with blepharospasm, a cause can not be found (essential blepharospasm). Genetic predisposition is believed to play a role in many of such patients. In rare cases, blepharospasm can be caused by stroke or a brain tumor. Blepharospasm is an uncommon

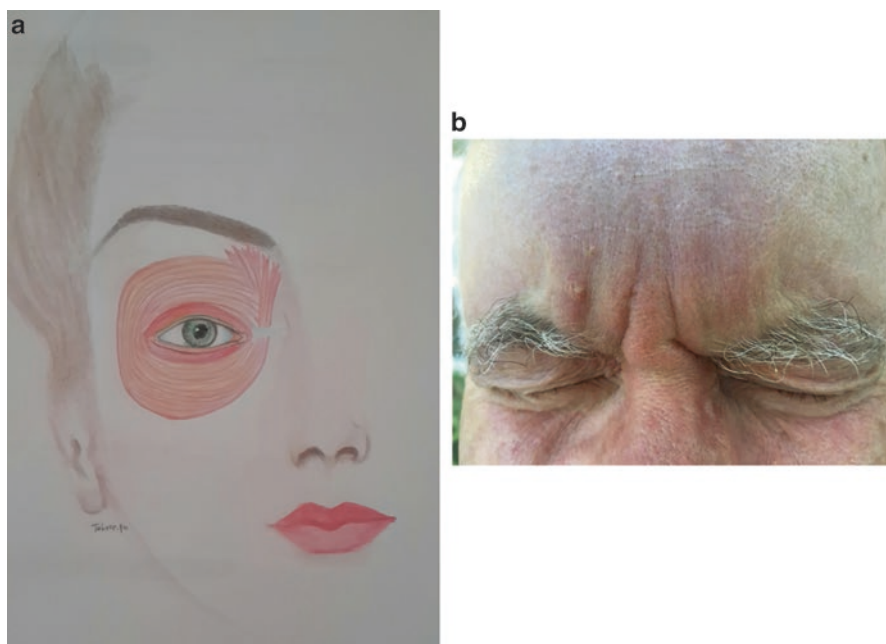


Fig. 11.1 (a) Orbicularis oculi muscle. The muscle has a palpebral part that is attached to the lid and an orbital part that is further out and circles the eye. (b) blepharospasm closing the eyes

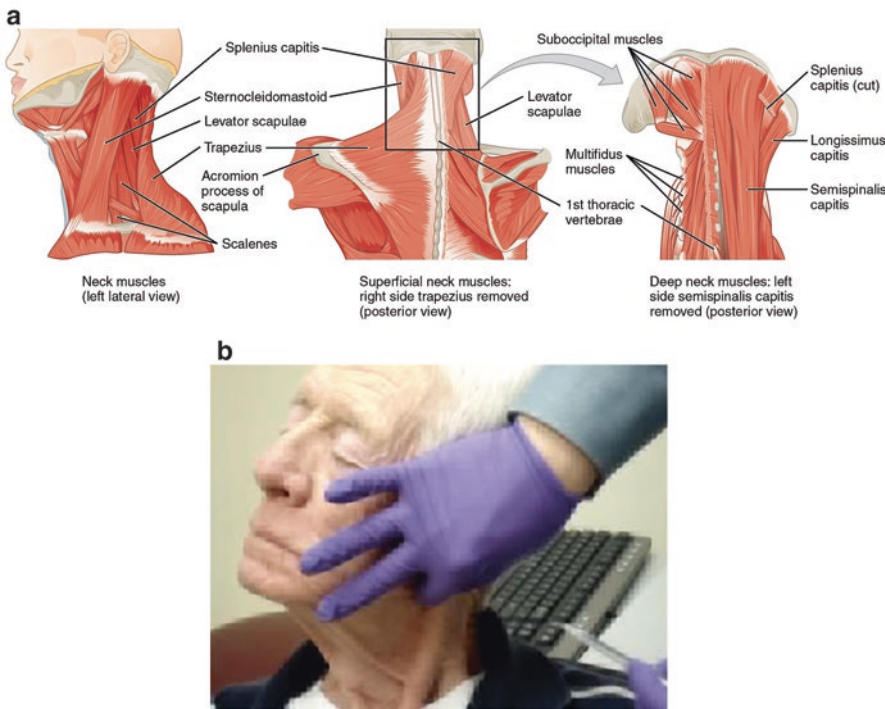


Fig. 11.6 (a) Muscle of the anterior and posterior neck, over activity of which can cause different forms of cervical dystonia. From Wikimedia. Reproduced under creative commons attribution (b) Injecting an enlarged and hyperactive sternocleidomastoid mmuscle(SCM) forcing the neck to turn right in a patient with severe torticollis

Table 11.I Some commonly injected muscles in cervical dystonia

Muscle pair (right and left)	Location	Function
Stenocleidomastoid (SCM)	Front of the neck	Turns the neck to the opposite side, tilts the neck to the same side, bends the neck.
Splenius capitis(SC)	Back of the neck	Rotates and tilts the neck to the same side
Scalenus anterior (SCA)	Front the neck	Tilts the head to the same side
Trapezius (T)	Shoulder	Elevates the shoulder
Elevator Scapulae(LS)	Upper back extending to the front of the neck	Elevates the scapula Tilts the head to the same side