



## REVIEW ARTICLE



# A toxin not toxic? Botox in dentistry and a factual evaluation of its merits and demerits

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Received: 18 August 2018

Accepted: 23 September 2018

doi: 10.15713/ins.ijcdmr.129

**How to cite the article:**

Vasudevan P, Setty S. A toxin not toxic? Botox in dentistry and a factual evaluation of its merits and demerits. Int J Contemp Dent Med Rev, vol.2018, Article ID: 010918, 2018.  
doi: 10.15713/ins.ijcdmr.129

**Abstract**

**Background:** Botulinum toxin has been known to humankind for ages but has not been gaining enough popularity until recent times. Initially, it was known to be nothing but threatening to its host, but through time, it has evolved and changed ones perception toward it by a breakthrough in medicine signifying some of the types of the known forms of toxin to be valuable assets. Although now very regularly used by people, it is most commonly known for its cosmetic value, little is the value for its clinical essence. **Aim:** The aim of this article is to throw light on the therapeutic aspect of this toxin and how if carefully used can result as a boon or ban subjective to case selection and individual variation post-close filtering by the clinician. **Conclusion:** This article will help one see this material through a new aspect, and it will give a perspective of its positive future usage but with great care attached to the thought of it being nonetheless a toxin if not handled rightly. **Clinical Significance:** The mention of its use for temporomandibular joint pain, bruxism, sialorrhea, and a host of other conditions from a more palliative and surgically adjunct nature through previous reports by various clinicians worldwide helps one think in the lines of its usage in the therapeutic aspect but also alerted to be used in caution.

**Keywords:** Botox, botulinum toxin, cosmetic, dentistry, therapeutic**Background**

Botox or more accurately botulinum toxin is a rather popular topic when spoken in terms of cosmetic medicine. The origin of this particular toxin dates back to the 19<sup>th</sup> century during the time of “sausage poisoning” in Germany when it was discovered by Sir Justinus Kerner.<sup>[1]</sup> Back in the day, it was nothing but a threat to the people and not until the 1980s did it come to light with its possible therapeutic use.<sup>[2]</sup> The toxin is produced by the bacterium *Clostridium botulinum* which is anaerobic and a Gram-positive rod-shaped bacterium. The toxin ranges from types A to H. Here, the most interesting of them are the types A and B which with its carefully filtered therapeutic forms onabotulinum toxin A, abobotulinum toxin A, incobotulinumtoxin A, and rimabotulinumtoxinB help in the practice of medicine.<sup>[3]</sup>

**Aim**

It is aimed at an unbiased evaluation of the already existent methods and records of its usage by many practitioners. This particular topic is regarding the therapeutic aspect of using botulinum toxin, its increasing popularity on these grounds and

a factual discussion of whether this particular toxin can be used carefully and commonly in future.

**Mechanism of Action**

Botulinum toxin being a neurotoxin is known to cause something called “flaccid paralysis,” wherein there will be a temporary deinnervation of muscles (specifically skeletal muscles) which inhibits the nerve endings from releasing acetylcholine. However its effect being definitely temporary solves the problem post its wear by reinstating the neuromuscular transmission by the growth of new axonal terminals.<sup>[4]</sup> Thus, in case of several treatments, this toxin could be used as a palliative remedy than curative. Botulinum toxin also shows preventive nature to acetylcholine release at parasympathetic nerve terminals.<sup>[4]</sup> It has also been shown to inhibit the release of certain neurotransmitters causing generation of pain such as glutamate, substance P, and calcitonin gene-related peptide. This particular action which has led many surgeons to use it for temporomandibular joint (TMJ) disorders.<sup>[5,6]</sup>

## Uses

Botulinum toxin has been popularized by its significant use in the cosmetic field, its recent advancement in the therapeutic field has also been equally eye catching. Its use in the field of dentistry is minimal but showing a steady graph ready to rise with time, awareness, and technology. A brief yet significant description has been put forward here as a toxin of “food for thought.”

### *Botox can save one from a clenched and nervous life*

It does have an answer for the treatment of bruxism. Yet, the repercussions of such a treatment are quite important to note. Bruxism is often described as the unconscious clenching and grinding of teeth while asleep; however, it is not uncommon to experience it while awake due to various reasons ranging from habits to problems such as stress and anxiety that further lead to physical pain and dental problems.<sup>[7]</sup> It is often seen in patients with special needs such as cerebral palsy and autism patients and can result in excessive dental wear, TMJ pain, avulsion of teeth, and other such problems. Several patients have been treated with botulinum toxin type A which was injected into the masseter muscle.<sup>[8]</sup> This leads to a temporary paralysis of the muscle and relieves it from causing excessive clenching or grinding. It provides tremendous relief to patients who are suffering day in and day out from jaw soreness, headaches, and unpleasant problems associated with bruxism.

## Method of Administration

Patient receives 1, 2, or 3 sets of injections depending on clinical response. However, the treatment is strictly temporary in nature and not a permanent solution to the patients situation.<sup>[9]</sup> Once Botox is injected into the muscle, it takes approximately 10 days for full result and will usually last 2–3 months.<sup>[10]</sup>

## Demerits

Injecting botulinum toxin into the jaw muscles means your unable to bite down with the same force.<sup>[11]</sup> Post-injection soreness in the site of injection as well as irritation is seen and rare cases systemic weaknesses may also manifest.<sup>[12]</sup> Other pain disorders like TMJ disorders and head and neck disorders like cervical dystonia (spasmodic torticollis) can also be treated in a similar manner.<sup>[4]</sup>

### *Many individuals have an embarrassing fit of salivating more than normal, Botox can be a solution to one's socially awkward feelings*

Excessive salivation also known as sialorrhea can cause great difficulties in children and adults. Sialorrhea is a common and severe problem in children and adults suffering from cerebral palsy or neurological disorders.<sup>[13]</sup> It causes a major hygienic and psychological issues and is highly distressing to a population living under an observant and highly critical society. The secretion of saliva being under parasympathetic control is caused by the release of acetylcholine which works as a specific neurotransmitter. Hence, preventing the release of this

neurotransmitter will lead to reduction in salivary secretion.<sup>[14]</sup> When botulinum toxin type A is injected into the salivary gland, it is done under the guidance of an interventional radiologist who uses a ultrasound machine to find the glands in the face producing saliva. Using ultrasound imaging, as guide a small needle is inserted through skin which reaches the gland and small doses of the toxin are injected into the space.<sup>[14]</sup> On a normal basis, salivary Botox injections take 1 h to complete.

## Demerits

It was found that a patient suffered from sialorrhea all life secondary to cerebral palsy. The patient received three injections, after the first injection the patient developed difficulty in breathing, nocturnal cough, thick mucus expectorate, and choking while eating and dysphagia. Even though the condition eventually improved but distaste for food remained. On continued subsequent injections, the appetite deteriorated more producing nocturnal choking and more mucus expectorate. The medication did improve the condition little but a general loss of appetite and weight remained. Despite the above problems, the patient responded to Botox normally with effective decrease in sialorrhea.<sup>[15]</sup> Other similar findings were documented by another clinician who performed a long-term study on safety and efficacy of Botox for sialorrhea in a certain number of children concluding with the observation of major complications such as aspiration pneumonia, severe dysphagia, and loss of motor control of head.<sup>[16]</sup>

### *Botox can be an adjunct to implant dentistry*

Botox in implant dentistry helps the treatment in a marginally positive way. The injection of Botox into the masseter muscle, as previously discussed, helps reduce the loading on an implant prosthesis soon after it is placed into the mouth preventing a significant decrease in the failure of implant seen in an otherwise normal case where severe loading can lead to failed implants.<sup>[17]</sup> Such treatment may be performed in major cases of implant where there is increased number of implants to be placed and patient requires a prosthesis temporarily to wade away any social or physical stigma. Hence, it helps in an indirect success to osseointegration, though no direct application its help in implant is noted.<sup>[18]</sup> It is not the method of choice when considering one or two implants and also it is not a direct effective toward the success of an implant.<sup>[18]</sup>

### *Botox makes one's smile better and displays more of white teeth than pink gums*

*One may feel that they age slower with Botox smoothening the wrinkles on the face.*

Botox can be solution to esthetic causes, but it is not a permanent resort. The demand for dermal fillers, subdermal fillers, and botulinum toxin has increased hugely. The constant lookout for non-surgical options has boomed the requirement of updating injection techniques and assurance of safety. Over the years, various clinicians around the world have found newer and safer techniques of injection.<sup>[19]</sup> However, the mechanism of action remains same where the toxin is injected into the muscle, but

actually it does not cause any alteration in the muscle at all. The toxin blocks the motor nerves that innervate the muscle. Hence, there is no sensory disturbance in the muscle, and this inhibits only the motor function which prevents the muscle from contracting, leading to stop the dynamic motion in the muscle causing the skin to form wrinkles.<sup>[20]</sup> Usually, the injection in the premolar muscles does lead to the reduction in the display of gingiva and is a fast resort to a cosmetic correction.<sup>[21,22]</sup> Similarly, the reduction of wrinkles also is treated by the same method. Yet, the fact that it is not a permanent resort leads to a disappointment to us. However, its reversible nature over a long period of time may also be a boon in many other cases.<sup>[23]</sup>

#### *Botox can be a relief before and after surgery for better healing*

Botox be the answer to the plea of early healing. Botox treatment before surgical intervention in cases of maxillofacial fractures can act as an adjunct to treatment by facilitating muscular relaxation. This will prevent any undue callus formation, leading to a path of healing (diverted reattachment of fractured bones) that is unintended. It also proves beneficial post-surgical treatment by preventing excessive forces on the healing tissues and thus helps in a better healing process.<sup>[18]</sup>

#### **The common side effects**

People may suffer from droopy eyes, nausea, muscle weakness, facial pain, indigestion or heartburn, tooth problems, high blood pressure, and eye swelling.<sup>[24]</sup>

#### **Discussion**

The patients guided to undergo Botox treatment must be made aware of the nature of the action of the treatment. Furthermore, they must be informed of the high cost of treatment as well as temporary nature which will causes a repeated dosage of the same and the time taken for a plausible affect as well as the time taken after which the effect will wear off. The lack of its promise to give a permanent solution may also cause a psychological distress on the patient after one particular session of treatment; hence, the patient's state of mind to accept this temporary nature should be ascertained or for a long-term series of appointments and sessions with the clinician along with the added woes of economic crises explained properly before treatment starts. The patient is also to be made aware of the kind of unpleasant side effects of both minor and possible significantly major nature. It was stated in 2009 by the FDA that the injection of the toxin into the primary site may at times lead to the paralysis of unintended muscles, this can be a cause to paralysis of critical muscles causing arrhythmias and heart attack, and in some cases, seizures, respiratory arrest, and death.<sup>[25]</sup>

It may also be contraindicated absolutely and relatively in a few patients who may show some allergic reactions,<sup>[10,26]</sup> and hence, a thorough history must be obtained, a detailed blood workup done and a complete medical investigation must be undertaken. The clinician's experience and updated knowledge

must be verified from time to time to certain a safe nature of treatment. Botulinum toxin is quite commonly addressed as that which resolves cosmetic problems, but the therapeutic nature is still under check and not widely used. Under the confines of dentistry, its use may seem rather promising when stressed on the ease in which certain disorders as well as post-operative recuperation is concerned, but the use of this product is not to be taken lightly as after all it is designated a toxin for a reason. The use of Botox by the hands of an untrained clinician can cause this miracle toxin to be nothing else but a poison. Its accidental piercing of a vein is not uncommon and can cause a spectrum of difficulties, leading even up to a paralysis.<sup>[27]</sup> Care must be taken when concerned with its usage and foresight of all its demerits must be relevantly addressed before its temporary merits and a decision of how a particular patient may benefit more than lose from this treatment be a matter of detailed personalization to that specific individual only.

#### **Conclusion**

Botox does have a significant contribution in the field of dentistry, but its temporary nature, rear complications, and side effects of significant discomfort make it a seed yet not a grown plant when it comes to usage on a regular basis. An idea of its workmanship will not suffice and continued and calculated use of this product may be required to recognize the various facets of this toxin before it can be put on the list of wider usage and guaranteed success. It needs to be proved such that the significant yet small proportions of demerits can be curbed in the long run with only the merits to look forward to.

#### **Clinical significance**

Botulinum toxin has definitely proven to be palliative when it comes to treatment for various conditions like bruxism, cervical dystonia, TMJ pain, and also proven to help patients with sialorrhea. It can also be used as an adjunct in case of implant treatment when there is need to relieve the load on the implant temporarily accelerating the nature of healing process and thus treatment. Cosmetically as well it helps patients to be relieved of gummy smiles and bring about other subtle facial features. From a surgical aspect, it helps in relieving stress concentration on the surgical sites. However, case selection will be the empirical base of its use. While it can be used for many different conditions, one must always bear in mind that it may not be considered as a common course of treatment for all cases presenting in similar manners.

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