IOSR Journal Of Pharmacy
(e)-ISSN: 2250-3013, (p)-ISSN: 2319-4219
Volume 11, Issue 5 Series. I (May 2021), PP. 04-07
www.iosrphr.org

Clinical and Cosmetic Applications of Botulinum Toxin

Sena Saroğlu
Okan University Faculty of Medicine, Istanbul, TURKEY
Received 09 May 2021; Accepted 23 May 2021

Abstract: Botulinum toxin affects the neuromuscular junctions to create its therapeutic effects. It prevents the release of acetylcholine and provides the formation of flux paralysis. The cosmetic use of botulinum toxin is well known however there are also many clinical applications. Botulinum toxin can be used in various pathologies from migraine to hyperhidrosis. It acts by preventing contractions at trigger points that cause pain in bruxism. It provides regression and improvement in muscle pain and prevents the muscle hypertrophy and gives out better cosmetic results.

Keywords – Botulinum toxin, bruxism, cosmetics, masseter muscle, migraine

I. INTRODUCTION

Botulinum toxin is a toxin obtained from Clostridium botulinum bacteria and shows its effect by blocking neuromuscular activity for a certain period. [1] Dr. Alan B. Scott started using the toxin for the treatment of strabismus in the 1970s. [2] After Dr. Scott's success, the toxin has been applied in various cases of neuromuscular pathologies including tics and involuntary tremors. [3,4] Its use in cosmetic fields started getting noticed when Dr. Jean Carruthers observed that the wrinkles between the eyebrows disappeared in a patient, he treated for strabismus in 1992. [5,6] The cosmetic use of botulinum toxin was approved in 2002 by the FDA. [7] The toxin's use for medical purposes has expanded in recent years. The treatment of jaw joint disorders, masseter muscle hypertrophy, bruxism (very severe clenching and grinding of the teeth), muscle spasms include botulinum toxin injections. [8,9] The toxin can be applied to the armpits, palms, soles of the feet to prevent excessive sweating. [10] It is even used in the treatment of excessive salivary secretion caused by some psychiatric and neurological diseases. [11]

II. BOTULINUM TOXIN APPLICATION IN MIGRAINE

Migraine is a disease that seriously reduces the quality of life and workforce. [12] Genetic and environmental factors are known to play a role. It is more common in women. [13] "Chronic migraine pain" is referred to if migraine pains occur more than 15 days of a month with different intensities. [14]

10% of migraine patients are chronic migraine patients. Familial transmission is at the rate of 40-75%. [13,15] Usually, throbbing headache on one side of the head, intolerance to light and sound, nausea are seen. Some foods consumed (chocolate, dairy products, soy products, caffeinated drinks, etc.), not consuming enough water, eating by skipping meals, sleep irregularities, exhausting the body by doing intense and uncontrolled sports, very bright lights, sudden weather changes, psychological factors, Causes such as hormone changes and alcohol consumption trigger migraine attacks. [13, 16]

Levels of Migraine can be listed as the following: Level 1: Migraine attacks are rare at this level. Patients have at least 2 and at most 7 attacks per month. Level 2: Migraine attacks become frequent. There is chronicity. There are at least 8 and at most 12 attacks per month. Level 3: This is the most critical level of the disease. The patient moves away from his daily life and suffers pain for at least 20 days a month. Types of Migraine can be listed as the following: Migraine Without Aura: Only headache is seen. Migraine with Aura: Hazy vision or inability to see, nausea, seeing light spots, stiffness when talking, etc. In the basilar migraine type, attacks of tinnitus and dizziness occur. [17-19]

In recent years, botulinum toxin (BTX) application in migraine has become a highly preferred method to reduce the number and severity of attacks in chronic migraine patients. It is a secondary treatment method aimed at preventing the onset of chronic migraine attacks by weakening the areas of excessive muscle contraction that trigger migraine attacks with the effect of the toxin in a controlled manner. [20,21] In 2010, the FDA (American Drug Administration) approved botulinum toxin as a drug for the prevention of migraine. [22] After this approval, botulinum toxin applications for migraine began to be widely used. Botulinum toxin is applied to certain points to determine the muscle clusters that initiate migraine attacks and to reduce active contraction forces. BTX is injected into the determined points in the forehead, temples and the neck. [20,21] The effect starts from the 3rd day. However, the full clinical effect occurs within 10-14 days and lasts 4-6 months.

The effect lasts shorter in those with a high metabolic rate. [20, 23] BTX for migraine is a treatment that must be done by a specialist since the toxin application involves the head and neck region according to the severity of migraine.

III. BOTULINUM TOXIN APPLICATION TO THE MASSETER MUSCLE

The masseter is the name given to the chewing muscles on both sides of the jaw that enable us to tighten our jaw. Botulinum toxin is injected into the masticatory muscle (masseter). Thus, the muscle that has grown more than normal due to clenching and grinding is weakened and contracted. It also helps with the problem of clenching teeth as it relaxes the jaw muscles and relieves the general tension in the face. The pain in the temples and ears of the patients decreases and disappears. The cosmetic results of BTX also occur. [8]

Botulinum toxin application to the masseter muscle also improves the square face appearance caused by excessive muscle growth, resulting in a thinner, younger face shape. It makes a round or chubby face slimmer and more prominent; reveals the cheekbones, makes the chin area look thinner. [24]

Botulinum toxin is injected directly into the masseter muscle. This process takes less than ten minutes. Most patients can withstand the injections even without anesthetic cream. After the application, you can return to daily activities. It is necessary to wait two to three weeks to see the full effect. Results can last from four to six months, depending on how fast your body metabolizes BTX This process should be repeated every six months to maintain the effect of BTX. [8]

IV. BOTULINUM TOXIN APPLICATION IN HYPERHIDROSIS

Excessive sweating of the hands, feet and armpits bother people suffering from hyperhidrosis and it can cause uncomfortable social situations. It affects personal and professional life. It might decrease the person's self-esteem. [25]

Before starting the botulinum toxin application for sweating, local anesthesia cream is applied to the area to be treated. The local anesthetic cream takes approximately 20 minutes to numb the area. At the end of 20 minutes, the excess cream is cleaned off the skin. The injection period usually takes up less time and is complete after 10 minutes on average. It takes 3 to 7 days for the BTX to show its effects and prevent hyperhidrosis. While the effect lasts for 4-6 months in aesthetic applications, the duration of effect in hyperhidrosis treatment extends up to one year. [26, 27]

V. BOTULINUM TOXIN APPLICATION IN HYPERSALIVATION

Hypersalivation is a condition in which saliva flows out of the mouth continuously, which may occur in children and adults, disturbing the patient and their relatives. This situation may occur because of neurological or psychiatric diseases. [28] The secretion is reduced by injecting botulinum toxin into the excessive salivary gland or glands. Anti-salivatory effect is achieved by blocking the release of acetylcholine at the neuroglandular junction of the gland. [29]

VI. BOTULINUM TOXIN APPLICATION IN GUMMY SMILE

A gummy smile is when the upper lip rises excessively, and an exaggerated (more than 2 mm) display of the gingiva occurs. This causes a cosmetically undesirable appearance while laughing for some patients. While some of these people laugh, they try to cover up the negative picture by bringing their hands towards their mouths. This situation improves after the applications of the BTX is made at the specified doses varying from 8 to 32 units and at appropriate points into the muscles that lift the upper lip upwards. Although the effects start at the 5^{th} day the visibly satisfactory results can take 15 days to be seen. [30]

VII. OTHER COSMETIC USES OF BOTULINUM TOXIN

Botulinum toxin applications can be applied to eliminate and reduce wrinkles and lines on the face, forehead, between the eyebrows, around the eyes-mouth and neck. The effect of BTX application is dose dependent and reversible cosmetic application. Parallel lines on the forehead and wrinkles around the eyes that are described as "crow's feet" cause a tired and old face appearance. [31] The toxin can also be applied to the lines and wrinkles called "smoker line" that occur around the mouth, especially in smokers. BTX effect occurs less in the lower half than in the upper half. [32, 33]

Wrinkles on the neck and platysma (neck muscle) bands also cause an undesirable cosmetic appearance. BTX is effective in eliminating the orange peel appearance on the chin and also beneficial for the jaw lines to be thinned for a more appealing appearance. [34]

Botulinum toxin’s use cosmetic uses also include lifting the eyebrows, lifting the tip of the nose, and reducing the sagging of the face. [35]

VIII. CONCLUSION

Botulinum toxin acts by temporarily relaxing the muscles it is applied to. The patient's muscle mass, wrinkle degree, anatomical structure, and skin thickness of the application areas determine the amount of drug to be injected. Muscle weakness starts 2-3 days after the treatment, the effects are seen in 1-2 weeks and the last for 4-6 months. This period can take 8-12 months with repeated injections. This period may be prolonged or shortened, depending on the patient. The patient is checked 10-14 days after the procedure. If necessary, a second application or touch-up can be done after 4-6 weeks. In conclusion, botulinum toxin is an effective treatment method for various clinical conditions as well as being a widely used cosmetic application.

REFERENCES

[1] Carruthers J, Carruthers A. The evolution of botulinum neurotoxin type A for cosmetic applications. *J Cosmet Laser Ther. 2007;9(3):186-192*. doi:10.1080/14764170701411470

[2] Persaud, R., Garas, G., Silva, S., Stamatoglou, C., Chatrath, P., & Patel, K. (2013). An evidence-based review of botulinum toxin (Botox) applications in non-cosmetic head and neck conditions. *JRSM short reports*, *4*(2), 10. https://doi.org/10.1177/2042533312472115

[3] Ney JP, Joseph KR. Neurologic uses of botulinum neurotoxin type A. *Neuropsychiatr Dis Treat*. 2007;3(6):785-798. doi:10.2147/ndt.s1612

[4] Camargo CHF, Teive HAG. Use of botulinum toxin for movement disorders. *Drugs Context*. 2019;8:212586. Published 2019 Jun 18. doi:10.7573/dic.212586

[5] Carruthers A, Carruthers J. Eyebrow height after botulinum toxin type A to the glabella. *Dermatol Surg*. 2007;33(1 Spec No.):S26-S31. doi:10.1111/j.1524-4725.2006.32328.x

[6] Carruthers, J., & Carruthers, A. (2004). Botox: beyond wrinkles. *Clinics in dermatology*, *22*(1), 89–93. doi.org/10.1016/j.clindermatol.2003.11.013

[7] Park MY, Ahn KY. Scientific review of the aesthetic uses of botulinum toxin type A. *Arch Craniofac Surg*. 2021;22(1):1-10. doi:10.7181/acfs.2021.00003

[8] Kef K. Application of Botulinum Toxin in Patients with Secondary Otalgia Caused by Bruxism. *J Pain Res*. 2021;14:1051-1059. doi:10.2147/JPR.S292550

[9] Fernández-Núñez T, Amghar-Maach S, Gay-Escoda C. Efficacy of botulinum toxin in the treatment of bruxism: Systematic review. *Med Oral Patol Oral Cir Bucal*. 2019;24(4):e416-e424. Published 2019 Jul 1. doi:10.4317/medoral.22923

[10] Rystedt A, Swartling C, Naver H. Anhidrotic effect of intradermal injections of botulinum toxin: a comparison of different products and concentrations. *Acta Derm Venereol*. 2008;88(3):229-233. doi:10.2340/00015555-0419

[11] Alvarenga A, Campos M, Dias M, Melão L, Estevão-Costa J. BOTOX-A injection of salivary glands for drooling. *J Pediatr Surg*. 2017;52(8):1283-1286. doi:10.1016/j.jpedsurg.2016.09.074

[12] Burton WN, Landy SH, Downs KE, Runken MC. The impact of migraine and the effect of migraine treatment on workplace productivity in the United States and suggestions for future research. *Mayo Clin Proc*. 2009;84(5):436-445. doi:10.1016/S0025-6196(11)60562-4

[13] Goadsby PJ, Holland PR, Martins-Oliveira M, Hoffmann J, Schankin C, Akerman S. Pathophysiology of Migraine: A Disorder of Sensory Processing. *Physiol Rev*. 2017;97(2):553-622. doi:10.1152/physrev.00034.2015

[14] Katsarava Z, Buse DC, Manack AN, Lipton RB. Defining the differences between episodic migraine and chronic migraine. *Curr Pain Headache Rep*. 2012;16(1):86-92. doi:10.1007/s11916-011-0233-z

[15] Buse DC, Fanning KM, Reed ML, et al. Life With Migraine: Effects on Relationships, Career, and Finances From the Chronic Migraine Epidemiology and Outcomes (CaMEO) Study. *Headache*. 2019;59(8):1286-1299. doi:10.1111/head.13613

[16] Nowaczewska M, Wiciński M, Kaźmierczak W, Kaźmierczak H. To Eat or Not to Eat: A Review of the Relationship between Chocolate and Migraines. *Nutrients*. 2020;12(3):608. Published 2020 Feb 26. doi:10.3390/nu12030608

[17] Lantéri-Minet M, Valade D, Géraud G, Chautard MH, Lucas C. Migraine and probable migraine--results of FRAMIG 3, a French nationwide survey carried out according to the 2004 IHS classification. *Cephalalgia*. 2005;25(12):1146-1158. doi:10.1111/j.1468-2982.2005.00977.x

[18] Diener HC, Dodick DW, Goadsby PJ, Lipton RB, Olesen J, Silberstein SD. Chronic migraine--classification, characteristics and treatment. *Nat Rev Neurol*. 2012;8(3):162-171. Published 2012 Feb 14. doi:10.1038/nrneurol.2012.13

[19] Ying G, Fan W, Li N, et al. Clinical characteristics of basilar-type migraine in the neurological clinic of a university hospital. *Pain Med*. 2014;15(7):1230-1235. doi:10.1111/pme.12402

[20] Herd CP, Tomlinson CL, Rick C, et al. Botulinum toxins for the prevention of migraine in adults. *Cochrane Database Syst Rev*. 2018;6(6):CD011616. Published 2018 Jun 25. doi:10.1002/14651858.CD011616.pub2
[21] Agostoni EC, Barbanti P, Calabresi P, et al. Current and emerging evidence-based treatment options in chronic migraine: a narrative review. *J Headache Pain*. 2019;20(1):92. Published 2019 Aug 30. doi:10.1186/s10194-019-1038-4
[22] Loder E, Rizzoli P. Pharmacologic Prevention of Migraine: A Narrative Review of the State of the Art in 2018. *Headache*. 2018;58 Suppl 3:218-229. doi:10.1111/head.13375
[23] Diener HC, Dodick DW, Aurora SK, et al. OnabotulinumtoxinA for treatment of chronic migraine: results from the double-blind, randomized, placebo-controlled phase of the PREEMPT 2 trial. *Cephalalgia*. 2010;30(7):804-814. doi:10.1177/0333102410364677
[24] Farolch-Prats L, Nome-Chamorro C. Facial Contouring by Using Dermal Fillers and Botulinum Toxin A: A Practical Approach. *Aesthetic Plast Surg*. 2019;43(3):793-802. doi:10.1007/s00266-019-01361-1
[25] Glaser DA, Hebert A, Pieretti L, Pariser D. Understanding Patient Experience With Hyperhidrosis: A National Survey of 1,985 Patients. *J Drugs Dermatol*. 2018;17(4):392-396.
[26] McConaghy JR, Fosselman D. Hyperhidrosis: Management Options. *Am Fam Physician*. 2018;97(11):729-734.
[27] Nawrocki S, Cha J. Botulinum toxin: Pharmacology and injectable administration for the treatment of primary hyperhidrosis. *J Am Acad Dermatol*. 2020;82(4):969-979. doi:10.1016/j.jaad.2019.11.042
[28] Steffen A, Jost W, Bäumer T, et al. Hypersalivation: update of the German S2k guideline (AWMF) in short form. *J Neural Transm (Vienna)*. 2019;126(7):853-862. doi:10.1007/s00702-019-02000-4
[29] Jun JS, Seo HG, Lee ST, Chu K, Lee SK. Botulinum toxin treatment for hypersalivation in anti-NMDA receptor encephalitis. *Ann Clin Transl Neurol*. 2017;4(11):830-834. Published 2017 Sep 26. doi:10.1002/acn3.467
[30] Mostafa D. A successful management of sever gummy smile using gingivectomy and botulinum toxin injection: A case report. *Int J Surg Case Rep*. 2018;42:169-174. doi:10.1016/j.ijscr.2017.11.055
[31] Small R. Botulinum toxin injection for facial wrinkles. *Am Fam Physician*. 2014;90(3):168-175.
[32] Carruthers J, Carruthers A. BOTOX use in the mid and lower face and neck. *Semin Cutan Med Surg*. 2001;20(2):85-92. doi:10.1053/sder.2001.25139
[33] Nanda S, Bansal S. Upper face rejuvenation using botulinum toxin and hyaluronic acid fillers. *Indian J Dermatol Venereol Leprol*. 2013;79(1):32-40. doi:10.4103/0378-6323.104667
[34] Seidman LM, Brooks JK, Bashirelahi N. Botulinum toxin: a review of applications for the head and neck. *Gen Dent*. 2019;67(2):55-58.
[35] Kattimani V, Tiwari RVC, Gufran K, Wasan B, Shilpa PH, Khader AA. Botulinum Toxin Application in Facial Esthetics and Recent Treatment Indications (2013-2018). *J Int Soc Prev Community Dent*. 2019;9(2):99-105. doi:10.4103/jispcd.JISPCD_430_18

Sena Saroğlu. "Clinical and Cosmetic Applications of Botulinum Toxin." *IOSR Journal of Pharmacy (IOSRPHR)*, 11(05), 2021, pp. 04-07.