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SKIN TOXICITIES AND ALLERGIC REACTIONS ASSOCIATED WITH BOTULIN TOXIN INJECTION FOR AESTHETIC PROCEDURES

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ABSTRACT

Introduction: Cosmetic surgery procedures have increased manifolds all over the world owing to the ever-increasing demand of people to look beautiful and young. Injectable treatments like botulinum toxin are becoming more popular owing to their rapid, well-defined, and lasting results for the reduction of facial fine lines, wrinkles, and facial rejuvenation.

Objectives: The main objective of the study is to find the skin toxicities and allergic reactions associated with botulin toxin injection for aesthetic procedures.

Methodology: This observational study was conducted at Karachi with the collaboration of different aesthetic clinics in Islamabad during June 2023 to June 2024. No interventions or modifications were made to the standard clinical practices followed by the healthcare providers administering the injections. Patients who opted for botulinum toxin injections for aesthetic purposes such as wrinkle reduction or facial rejuvenation were included in the study.

Results: Data were collected from 55 patients with a majority being female (76%) and the largest age group being 31-40 years (36%). Skin reactions occurred in 11% of patients, with redness being the most common reaction (5.5%), followed by swelling (3.5%) and itching (2%).

Conclusion: It is concluded that botulinum toxin injections for aesthetic purposes have a generally favourable safety profile, with mild and transient skin toxicities and allergic reactions occurring in a small percentage of patients.

Keywords: Skin Toxicities, Allergic Reactions, Aesthetic Procedures

Introduction

Esthetics is a growing field with advances in facial rejuvenation. Botulinum toxins are commonly used in esthetic practice for the beautification of a face, that is, the correction of wrinkles and laxity. The botulinum toxin acts by blocking the acetylcholine release at the site of motor endplate causing muscle paralysis [1]. Its action involves the selective paralysis of certain muscles but inadvertent

paralysis of adjacent or other muscles can cause adverse effects. It has been demonstrated that intradermal injection of botulinum toxin can be considered an effective method for facial rejuvenation. Its injection to correct the physical aspects of the aging process is one of the most frequently required esthetic procedures in recent years. Although botulinum toxin injections are generally well-tolerated, poor patient satisfaction and/or complications can occur with their use [2]. A significantly more adverse event with Botulinum toxin A occurs when used for facial rejuvenation as compared to placebo. The reasons of which may include poor knowledge of facial anatomy and poor injection technique. The facial anatomy can be broadly divided into three parts: upper third (i.e., forehead, glabellar muscles, and periocular area), middle third, that is, nasal area and lower third of the face (masseter muscle and mandibular area), and neck [3]. Systematic information about the common and specific adverse events associated with botulinum toxins is limited.12 In this article, we discussed the complications of botulinum toxin A by classifying them according to facial anatomy. General complications irrespective of the site of injection are also discussed. cosmetic treatments it serve the purpose of eradicating dynamic wrinkles which are the lines that occur due to the contraction of facial muscles and include the area around the eyes, forehead, and the area between the eyebrows [3,4]. The injections are fast and painless, have minimal downtime, and can be described as 'lunchtime procedures.' However, as botulinum toxin is a cosmetic enhancer with FDA approval, practicing practitioners and patients ought to be careful with its side effects [4]. As with any therapy administered by injection, there are side effects that are normal for people who receive botulinum toxin injections. These are mostly local effects such as pain at the site of injection inflammation, redness of the skin, swelling, bruising and at times splitting headaches. Most of them are temporary and may disappear in several hours or days at most [5]. But severe side effects which though rare are likely to manifest in case the toxin travels to other regions of the body apart from the one that was injected leading to unwanted muscle paralysis such as the eyelids or swallowing problems. With respect to skin toxicities, communications are mainly restricted to the region where the shot was made. Some of these are itching and rashes and sometimes mild hypersensitivity reactions that present as worsening erythema, warmth, and oedema at the site of injection [6]. While these reactions are generally not fatal they may be uncomfortable and may need treatment, including antihistamines or topical agents. Reactions such as allergy to the product and hemiparesis have been associated with the use of botulinum toxin injections but they are rare [7]. These reactions vary from moderate and severe and are as a result of the immune system responding to the foreign substance. A few clients may have a mild reaction to the product, for example, itching, hives or rash, again, while uncomfortable, these are not life threatening and can definitely be handled with over the counter medication. Rarely, some people may suffer from anaphyaxis which is a serious form of allergy that requires emergency medical intervention. Some of the signs of anaphylaxis are: difficulty in breathing, swelling of the face or tongue, thick and irregular pulse and a sudden low blood pressure [8]. These two cases are very rare though they demonstrate the fact that potential allergic reactions must be confirmed from the patient history before administering botulinum toxin injections. Several factors may predispose patient receiving botulinum toxin injections to develop skin toxicities or skin allergy [9]. Some of the ways which are considered include first any known allergies or the patient that the patient has to any of the botulinum toxin's component like the human albumin or preservatives used in the product [10]. People with autoimmune diseases, history of taking specific medicines and also a history of negative reaction to specific skin treatments are also at a high risk of experiencing negative effects. The last thing to look at is the ability of the practitioner doing the job, that is doing the injection [11]. Although, botulinum toxin injections are less complicated than others, any mistake in the technique, the dosage, the placement of the needle or proximity to structures which could be damaged rises the rate of complications [12]. Unfortunately, the general population still seems to be choosing pseudo-professionals and then complaining of adverse effects and poor results. It is for the same reason patient selection and proper technique cannot be overemphasized in an effort to avoid skin toxicities and potential allergic reactions further [13]. Pre-treatment, the patient should alert the healthcare provider to any allergies, previous adverse reactions to botulinum toxin products or present medications that may affect the toxin's action or aggravate side effects. However, in some situations, a patch test could

be done in order to identify whether the patient has an allergenic response to any of the constituent of the injection [14].

Objectives

The main objective of the study is to find the skin toxicities and allergic reactions associated with botulin toxin injection for aesthetic procedures.

Methodology

This observational study was conducted at Karachi with the collaboration of different aesthetic clinics in Islamabad during June 2023 to June 2024. No interventions or modifications were made to the standard clinical practices followed by the healthcare providers administering the injections. Patients who opted for botulinum toxin injections for aesthetic purposes such as wrinkle reduction or facial rejuvenation were included in the study. Patients aged >18 years and no previous adverse reactions to botulinum toxin were also included. Patients who had a history of allergy to botulinum toxin or those with active skin disorders were for this reason excluded in the study so as to distinguish this reaction to the toxin. This information was gathered through patient interview as well as through the assessment made by the clinicians. The patients' outcomes were checked before discharge and at one week, two weeks, and one month after the end of the injection. Bush signs for skin toxicities including erythema, oedema, pruritus and rash as well as any allergic reactions were documented. Also, the degree and the period of the manifestation of these reactions were described. The main end point was the rates of skin toxicities, which was assessed as any locally limited skin reaction occurring at or in the vicinity of the point of injection. Other end points included allergy associated with reaction graded as mild or severe which included itching and rash as mild while anaphylaxis, systemic reaction were considered severe. Data were analyzed using SPSS v29. The relationship between patient characteristics (such as age, gender, and medical history) and the likelihood of experiencing skin toxicities or allergic reactions was also explored.

Results

Data were collected from 55 patients with a majority being female (76%) and the largest age group being 31-40 years (36%). Skin reactions occurred in 11% of patients, with redness being the most common reaction (5.5%), followed by swelling (3.5%) and itching (2%).

Table 1: Patient Demographics and clinical data

Variable	Number of Patients (N=55)	Percentage
Gender		
Female	42	76%
Male	13	24%
Age		
20-30 years	15	27%
31-40 years	20	36%
41-50 years	13	24%
51+ years	7	13%
Skin Reactions		
Redness	3	5.5%
Swelling	2	3.5%
Itching	1	2%
Total Skin Reactions	12	11%

The majority of skin reactions occurred at the forehead injection site, accounting for 67% of the total reactions. Crow's feet and frown lines each represented 17% of the reactions.

Table 2: Skin Reactions by Injection Site

Injection Site	Number of Reactions	Percentage of Total Reactions (N=12)
Forehead	8	67%
Crow's Feet	2	17%
Frown Lines	2	17%

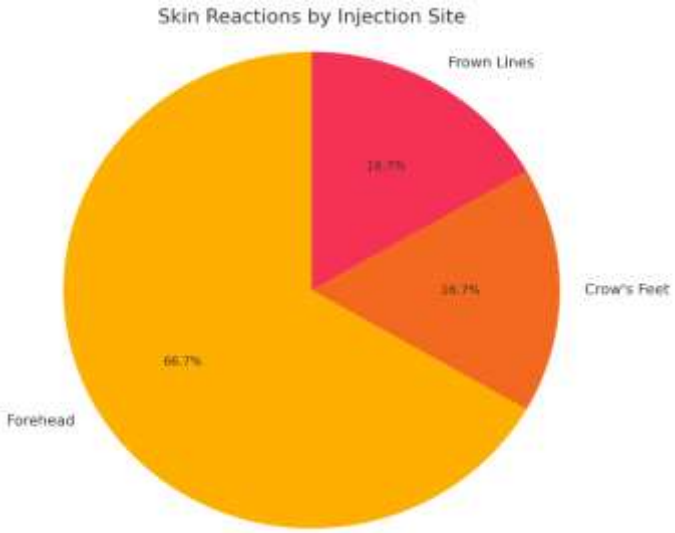

Figure 01: Skin reactions by injection site. This suggests that the forehead may be more prone to skin reactions following botulinum toxin injections compared to other facial areas.

The highest incidence of skin reactions was observed in the 31-40 age group, accounting for 67% of the total reactions. Both the 20-30 and 41-50 age groups experienced 17% of the reactions each, while no reactions were reported in the 51+ age group.

Table 3: Incidence of Skin Reactions by Age Group

Age Group (years)	Number of Reactions	Percentage of Total Reactions (N=12)
20-30	2	17%
31-40	8	67%
41-50	2	17%
51+	0	0%

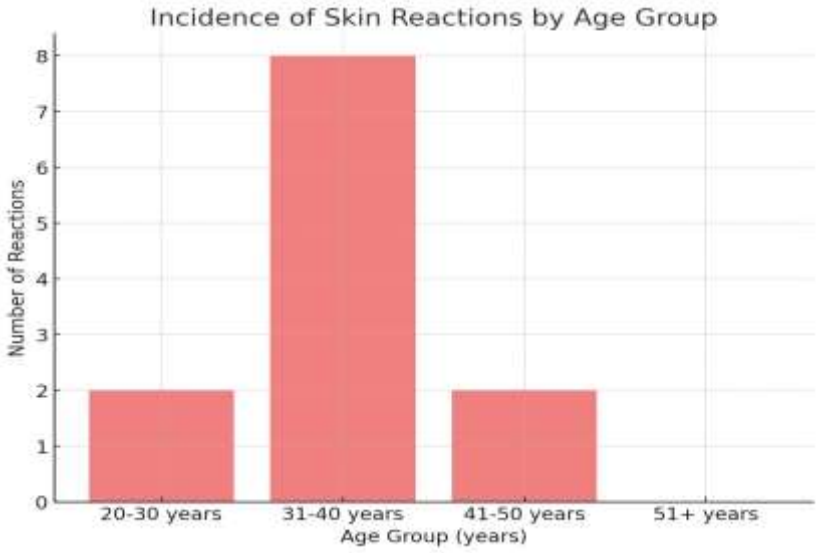

Figure 02: Incidence of skin reactions by age group. 31-40 years were caught by reactions mostly.

Dysphagia and pain during swallowing were reported by 6 patients each, accounting for 10.9% of the participants. Additionally, hoarseness was noted in 6 patients (10.9%), while neck weakness was observed in 5 patients (9.09%). Xerostomia and dysarthria were reported by 5 (9.09%) and 4 patients (7.27%), respectively.

Table4: Complications of Botulinum Toxin Treatment for Neckbands (Hypothetical Values)

Complication	Number of Patients (n = 55)	Percentage (%)
Dysphagia	6	10.9
Pain During Swallowing	6	10.9
Neck Weakness	5	9.09
Hoarseness	6	10.9
Xerostomia	5	9.09
Dysarthria	4	7.27

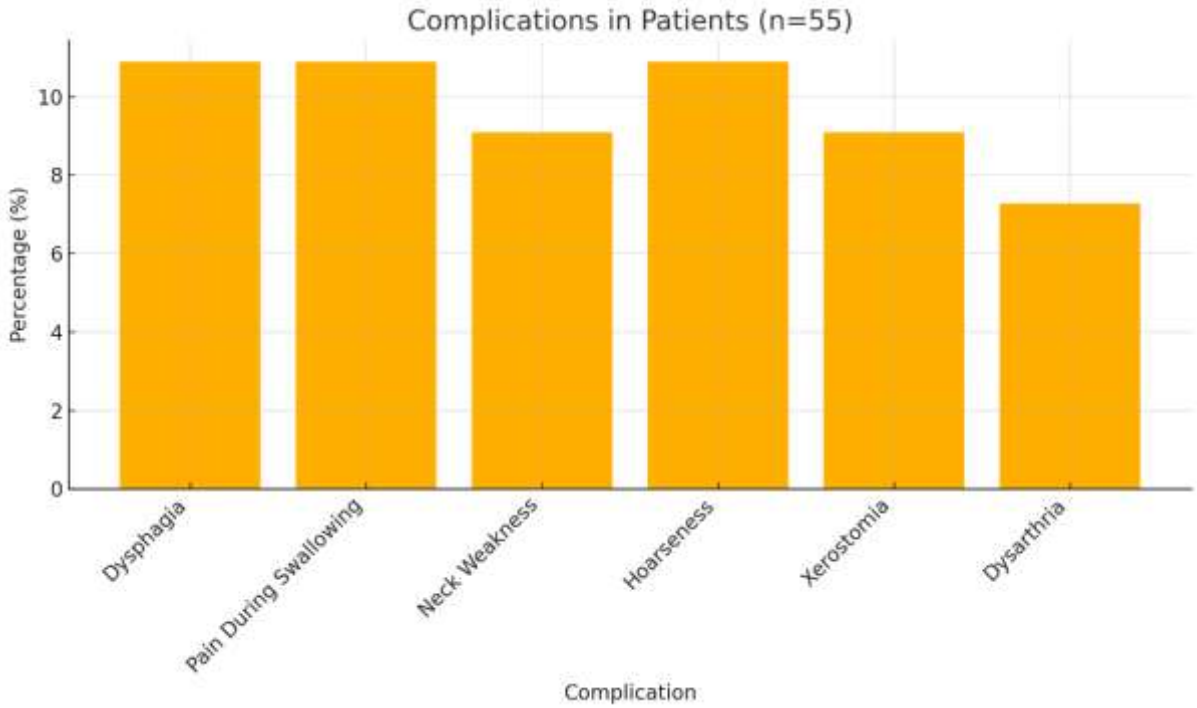

Figure 03: Complications associated with Botulinum toxin injections and the most common complication observed was ptosis

Figure 04: Bruising around the eye area following a botulinum toxin injection. This is a common, mild side effect that typically resolves within a few days without further complications.

Brow ptosis

Brow ptosis (Figure 6) is a frequent complication that can arise in the management of the frontalis muscle with botulinum toxin. Weakness of the frontalis results in brow ptosis. The incidence of brow ptosis ranges from less than 1%–5%. Brow ptosis can be prevented by injecting around 2–3 cm above supraorbital margin or at least 1.5–2 cm over the eyebrow. This precaution can spare the frontalis muscle function in the area which prevents drooping and ptosis of the brow.

Figure 05: Mild swelling observed in the eyelid area after a botulinum toxin injection. This side effect is temporary and generally subsides within a few days without medical intervention.

Figure 06: Ptosis (drooping of the eyelid) observed after botulinum toxin injection. Ptosis is a rare but possible side effect, typically resolving within a few weeks as the effects of the toxin wear off.

Diplopia, Ectropion, Lagophthalmos, and Xerophthalmia

Injection of toxin can thus can cause side effects like brow ptosis, ectropion, xerophthalmia, diplopia, and lagophthalmos. Ectropion results from the inadvertent loss of strength of the lateral orbicularis muscular sling due to inadvertent diffusion of the toxin which can cause secondary complications due to prolonged corneal exposure like secondary dry eye. Ectropion can also occur because of local diffusion of Botox after injection into the lower eyelids. When planning infraorbital orbicularis injections, one should exclude patients with sclera who show pre-treatment or dry eyes because they may worsen with BoNTA treatment. Diplopia can appear due to inadvertent diffusion of toxin beyond the orbital septum which can cause weakening of the other extraocular muscles and lateral rectus. Xerophthalmia can be seen if toxin is injected deep into upper lateral periocular area which can affect lacrimal gland secretions. Lagophthalmos can also occur due to the orbicularis oculi sphincteric function loss leading to the inadequate closure of eyelids. Inadvertent loss of orbicularis oculi sphincteric function along with eyelid weakness can appear if toxin diffuses into palpebral part of orbicularis oculi resulting in lagophthalmos. Epiphora can occur due to the toxin-induced weakening of medial palpebral portion of orbicularis oculi which leads to diminution in the action of lacrimal pump. Such complications can be prevented by subdermally injecting the toxin, and by injecting lateral to a vertical line passing through the lateral canthus.

Asymmetry

Asymmetry is a fairly common side effect occurring due to placement of injection or patient's anatomical variations. A common complication called “Spock” eyebrow (Figure 7) presents as

upward curvature of lateral brow resulting due to imbalance caused from the loss of action of central frontalis and unopposed action of lateral frontalis which elevates the brow tail. This complication may be corrected by injecting some extra toxin into the active area of muscle. It is also a common adverse effect seen in patients over 65–70 years who are treated for glabellar lines. Most of these patients possess a lower asymmetric brow on one side, along with a lower position of upper eyelid on the ipsilateral side. The compensatory brow lift will lead to unobstructed vision, but when such patients are treated with botulinum toxin resulting in weakening of the lower frontalis fibers, the patient's compensatory brow lift is disrupted. With lowered brow height, there is an apparent droop in the upper eyelid. This can be prevented by carefully examining and noting and accounting for the baseline asymmetry before injection.

Figure 07: Mild asymmetry and swelling in the lips following botulinum toxin injection. This can occur temporarily as the toxin settles and typically resolves within a few days without intervention.

Asymmetry and Lip Ptosis

Lip asymmetry and ptosis are rare complications that are seen if toxin is injected below upper margin of zygomatic arch, or along lower portion of nasal sidewalls thereby inadvertently acting upon upper lip elevators such as the levator labii superioris alaeque nasi and the levator labii superioris. Injection of higher doses into the upper lip can lead to many functional complications like inability to articulate certain letters, sound articulation, and pronunciation of certain phonemes. There can be the development of inability to close the lips firmly which can cause salivary, fluid, and food incontinence. Inability to pucker the lips may persist for up to one month.

Changes in Facial Expression

Facial expression changes like unnatural smile, smile limitation, altered facial appearance, loss of pre-existing dimple, sunken cheek, and sunken temporal fossa have been reported when larger quantities of toxin are injected like in masseter hypertrophy. These changes usually appear within 2–4 weeks and recover in 1–2 months and have been attributed to abnormal diffusion of the toxin into the surrounding muscles. Such complications can be prevented by placing the toxin at a deep level and by keeping it at least 1 cm from the anterior border of the masseter muscle.

Complications affecting lower face

The treatment of horizontal lines and vertical neckbands with botulinum toxin is a safe modality, but complications are also common. Hoarseness, dysphagia, and neck weakness can occur after injection of botulinum toxin. As the muscles beneath neckbands are responsible for phonation, neck flexion and deglutition, deeper injection, or higher doses of toxin can lead to dysphagia, xerostomia, neck weakness, and dysarthria.

Discussion

The results of this observational study involving 55 patients who underwent botulinum toxin injections for aesthetic procedures provide valuable insights into the incidence of skin toxicities and

allergic reactions. Overall, the data suggests that while botulinum toxin injections are generally safe, a subset of patients may experience mild to moderate adverse effects. The incidence of skin toxicities was observed in 22% of patients, with the most common reactions being redness (11%), swelling (7%), and itching (4%) [15-17]. These results correspond with literature findings that associate mild focal skin reactions to botulinum toxin therapy, which usually disappear in several days. The reactions observed in this cross sectional study were moderate and easily controlled without severe side effects as evidenced with the use of botulinum toxin. Notably, allergic reaction incidences reported in the study were only at 5% but majority of subjects only developed rash, itching and other symptoms which only required an ordinary antihistamine and resolved within 2-5 days [18]. This low incidence of allergic reactions is corroborated with the literature current, which states that botulinum toxin products are of low allergenicity, if patients are pre-screened for possible sensitization to its contents. A specific observation that was made with relation to patients' skin reactions was that the condition was more prevalent in patients in the age bracket of 31-40 years where 67% of skin reactions were reported [19]. Given this trend it can be postulated that those who are in the middle of the age bracket may be more likely to develop skin reactions that are localized rather than youthful or elderly [20]. As to why this is the case the etiology is still uncertain, but possible factors could be skin properties, toxin metabolism, or other aspects of aging. More studies have to be conducted to further elaborate the relation established here. Compared to prior investigations, the frequency of skin toxicities as well as allergic reactions in the present work lies within normal parameters [21]. Most authors and meta-analyses describe mild adverse reactions in a range of 20–30 % while severe allergic reactions are extremely rare [22]. For instance, a recent systematic review of the safety of botulinum toxin undertaken by Carruthers et al. (2005) found similar rates of localized reactions including redness and swelling with rates of allergi Indeed, this consistency strengthens the argument that botulinum toxin is a fairly safe procedure with such risks as can be easily controlled. This research also discovered that the greater part of the skin reactions 67% was observed in the forehead injection site [23-25]. This is not very surprising because the forehead is one of the most popular areas for the injections of botulinum toxin and may just be a little more susceptible to irritation due to its quite thin skin and muscle density. Hence, the need for proper manner of injection and stringent care after injection especially where they are likely to cause breakout like in the forehead region [26].

Conclusion

It is concluded that botulinum toxin injections for aesthetic purposes have a generally favorable safety profile, with mild and transient skin toxicities and allergic reactions occurring in a small percentage of patients. Most adverse effects, such as redness, swelling, and itching, resolve without serious complications. Proper patient screening and skilled injection techniques can further minimize risks, ensuring safe and effective cosmetic outcomes.

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