

BRIEF REPORT

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Double vision due to lateral rectus injury after cosmetic botulinum toxin injections

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Abstract

Facial intramuscular injections of Botulinum toxin (BoNT) injections are among the most common cosmetic procedures in dermatology. Rarely, serious adverse reactions such as blepharoptosis, diplopia and periorbital hematoma may occur with improper administration technique. Here we report a case of painless diplopia 5 weeks post-BoNT injection for 'crow's feet' likely due to inadvertent BoNT diffusion into the lateral rectus muscle causing a temporary palsy. This case aims to raise awareness of proper cosmetic BoNT injection techniques in the periorbital area to avoid ophthalmic complications.

KEYWORDS

botulinum toxin injections, cosmetic dermatology, 'crow's feet', diplopia, lateral rectus injury

INTRODUCTION

Botulinum toxin (BoNT) injections are the most common cosmetic procedure with approximately 3 million injections administered globally every year.¹ Botulinum toxin inhibits presynaptic release of acetylcholine at the neuromuscular junction, thereby, causing muscle paralysis at the injection site.² BoNT has been FDA approved for cosmetic procedures including facial and periocular wrinkles, including fine lines and rhytids at the outer corners of the eyes, known as 'crow's feet' and forehead/glabellar lines.^{3,4} Reported ophthalmologic side effects of facial BoNT use include blepharoptosis, periorbital oedema, pupillary dilatation, corneal irritation, and diplopia from ocular misalignment.¹ Diplopia is a rare complication of BoNT injection and generally occurs due to the BoNT toxin causing extra-ocular muscle weakness due to infiltration into the extra-ocular muscle caused by deeper

penetration of the needle into the orbital septum and repeated injections.⁵ Many ophthalmologic complications of BoNT injections can be prevented by increasing awareness of proper injection technique and orbital anatomy.

CASE REPORT

A 61-year-old female patient presented with 5 weeks of painless double vision and described the vertical separation of images, which resolved with monocular occlusion. The patient had her first session of bilateral cosmetic BoNT injections for crow's feet 14 days prior to symptom onset and had received 12 units bilaterally using a 30-gauge needle. Ophthalmic examination revealed a vision of 20/25 in the right and 20/20 in the left eye. The external examination did not reveal ptosis. Extra-ocular motility revealed abduction deficit in

Subheading: Cosmetic Dermatology

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the left eye and ocular alignment revealed a 2-prism diopter esotropia in primary gaze, left gaze, upgaze and downgaze.

Neurological examination revealed intact cranial nerves, normal motor strength in upper and lower extremities with normal proprioception and intact cerebellar function. The patient was diagnosed with an abduction deficit in the left eye, the differential for which included abducens nerve palsy from presumed vasculopathy, intracranial mass lesions, ocular myasthenia gravis, thyroid ophthalmopathy and increased intracranial pressure. MRI brain and orbits and laboratory testing for autoimmune and neuromuscular disorders was negative. The acetylcholine receptor antibody test for ocular myasthenia was negative. The patient presented to her dermatologist, who recognized the patient's history of cosmetic BoNT injections to the orbicularis oculi muscle. She was diagnosed with left lateral rectus palsy that occurred secondary to BoNT infiltration into the lateral rectus muscle in the left eye. Diplopia resolved spontaneously 4 months after the dermatology visit.

DISCUSSION

An inability to abduct the eye can occur from lateral rectus muscle paresis and can cause diplopia due to the resulting esodeviation. Esodeviation can also result from restrictive involvement of the ipsilateral medial rectus muscle due to thyroid eye disease or orbital fracture. The sixth cranial nerve that innervates the lateral rectus muscle can be affected by microvascular aetiology, intracranial structural lesions, increased intracranial pressure and autoimmune disease.⁶ However, this patient had minimal risk factors for abducens nerve palsy, and her clinical testing and neuroimaging were within normal limits.

In this patient, the suspicion for BoNT-induced diplopia was raised due to her recent history of having undergone the procedure. It is possible that a deeper injection leading to the diffusion of toxin into neighbouring neurovasculature and the left lateral rectus muscle caused a mild palsy.⁷ The muscle involved in crow's feet are the circular fibres of the orbicularis oculi which circumscribe the eye (Figure 1). To soften the crow's feet, BoNT should be injected superficially to relax the lateral raphe of the preseptal orbicularis oculi muscle (Figure 1). The lacrimal artery as well as the superior and inferior ophthalmic veins are susceptible to penetration by BoNT injections and inadvertent BoNT diffusion due to their anatomic proximity to the orbicularis oculi muscle. The lacrimal artery supplies the lateral rectus and the superior

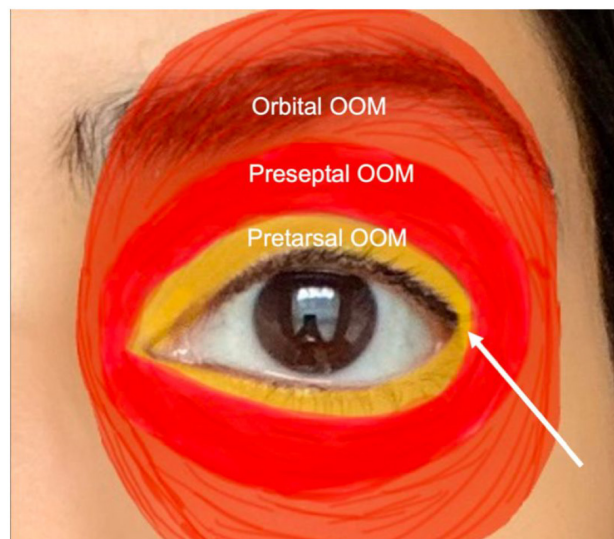


FIGURE 1 Anatomical zones of the orbicularis oculi muscle (OOM). The white arrow indicates the lateral border of the orbit.

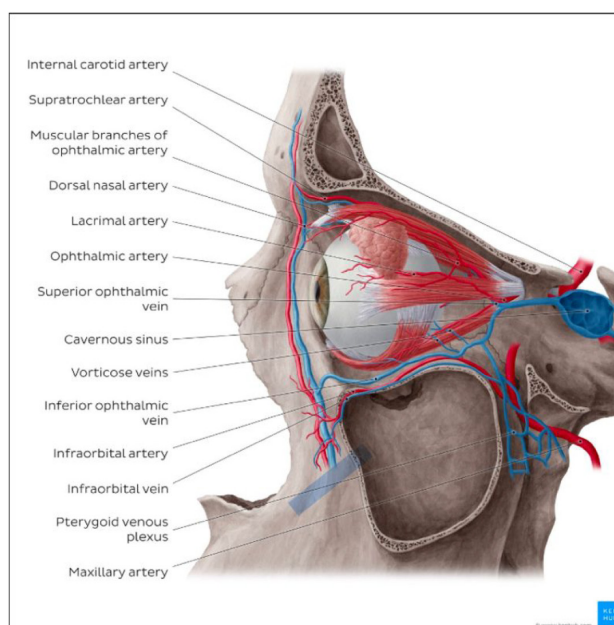


FIGURE 2 Blood supply and drainage of the lateral rectus (lateral view). Copyright: Kenhub GmbH, illustrator: Yousun Koh, 'Blood Vessels and Nerves of the Eye'. Kenhub, 15 August 2022, <https://www.kenhub.com/en/library/anatomy/blood-vessels-and-nerves-of-the-eye>.

and inferior ophthalmic veins drain the lateral rectus (Figure 2).⁶ Patients should be asked to smile to identify the centre of the crow's feet and injections should be placed, at minimum, 1–1.5 cm from the lateral margin of the orbital border (Figure 3).⁸ The typical dosing of Onabotulinum toxin A varies from 2.5 to 5 units per

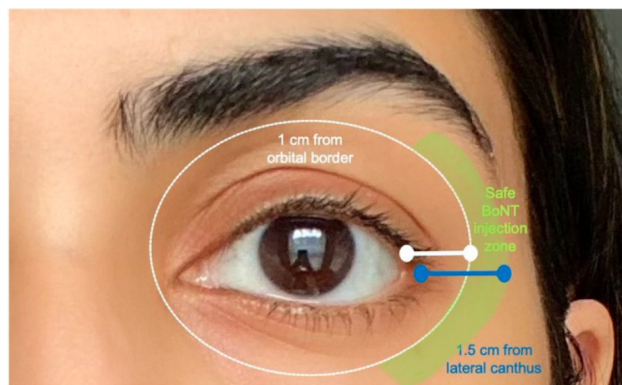


FIGURE 3 Crow's feet BoNT injection zones. The white border represents 1 cm from the orbital border and the blue line represents 1.5 cm distance from the lateral canthus. BoNT injections should be administered in the green region to avoid visual complications. The image is for diagrammatic purposes and is not drawn to scale.

injection site with 3–4 injections on each every 3 months. Administration of BoNT is typically done with a 30-gauge needle.³ Studies have shown that BoNT-related complications are dose-dependent and lower doses can decrease the frequency of adverse events.^{1,9}

In a review of 32 cases of BoNT-induced diplopia (avg. dose 21 total units), 50% were medical BoNT injections and 50% were cosmetic BoNT injections, indicating a similar risk in both cases.¹⁰ The most common areas for cosmetic injection were the lateral canthal area, glabella and forehead regions. Diplopia following BoNT injection was reported anywhere between 3 and 60 days after injection (mean 15 days) and the majority of BoNT-induced diplopia cases completely resolved within 1–12 weeks, with only two cases citing partial resolution. Other reported adverse effects of cosmetic BoNT-included optic neuropathy (one case) and ptosis (two cases).¹⁰ BoNT providers should be aware of the risk of lateral rectus injury and abduction paresis in the setting of BoNT injections. In this case, a dose of 12 units bilaterally was injected using a 30-gauge needle, however, it is suspected the injection was within 1 cm of the lateral border of the orbit. The diplopia was likely secondary to infiltration of BoNT in the lateral rectus muscle. The diplopia was mild and resolved on its own. By keeping injections superficial and trailing subsequent injections behind the previous, risk of injury to periorbital structures is reduced.⁶

CONCLUSION

BoNT is widely used in the treatment of facial rhytids. Although BoNT procedures are relatively safe,

proper administration techniques and a thorough understanding of facial anatomy are critical in preventing unwanted side effects. Providers should be aware of the ophthalmologic side effects of BoNT procedures, including diplopia, ptosis and injection site reactions. Although most adverse effects may self-resolve, some can be disabling. This case aims to raise awareness among dermatologists and other BoNT-certified professionals of the importance of proper injection technique in the periorbital area and the possible complication of lateral rectus infiltration.

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CONFLICT OF INTEREST STATEMENT

The authors have no conflict of interest to declare.

INFORMED CONSENT

Informed consent was obtained for the individual case included in the manuscript.

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