

Single Case

Incidental Treatment of a Subclinical Chronic Tension-Type Headache by Cosmetic Use of Botulinum Toxin A: A Case Report

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Keywords

Aesthetic complaints · Ageing · Botulinum toxin · Pain relief · Wrinkles · Headache

Abstract

Background: Headache is a common disorder of the nervous system; chronic headache in particular may affect quality of life negatively. The pathophysiology is multifactorial and not completely elucidated. Studies have demonstrated the beneficial effects of botulinum toxin A on chronic migraine headaches, but failed to show the same effect on chronic tension-type headaches. **Methods:** We present the case of a 32-year-old woman who after receiving cosmetic injections with botulinum toxin A for fine lines of the forehead experienced relief of subclinical tension-type headaches. **Conclusions:** Although the effect of botulinum toxin A on chronic tension-type headaches is limited, several studies demonstrate its pain-modulating effects, and as such it is worth paying attention to this potential beneficial effect when performing cosmetic injections with botulinum toxin A.

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Introduction

Headache is a common disorder of the nervous system, and particularly the chronic types can be debilitating and affect quality of life negatively [1]. Primary headaches are idio-

pathic headaches. They can be subdivided into tension type, migraine, trigeminal autonomic cephalalgias, and other primary headache disorders [2]. Chronic headache is defined as 15 or more episodes of headache per 30 days for at least 3 consecutive months. Tension-type headache is the most commonly occurring type of headache, with a 42% life time prevalence [1, 3]. It is estimated that its chronic form, chronic tension-type headache (CTTH), affects 0.5–4.8% of the world population [4]. Both forms present a challenge to treat adequately. Treatment of headache can be classified as abortive or prophylactic. Abortive treatment is aimed at the acute symptoms, while the prophylactic treatment is directed at preventing the recurrence of the symptoms, reduce the frequency, and relieve the symptoms when they occur.

The effect of botulinum toxin A (botA) on headache was first described as an incidental finding by Binder et al. [5] when describing the cosmetic applications of botA, noting its effects on several patients with a history of migraine or chronic headache pain. These effects have been further confirmed in several studies, most notably the PREEMPT [6]. In 2010, the US Food and Drug Administration approved botA as prophylactic treatment for chronic migraine headache (CMH). While the effect on CMH is well documented, the effect on CTTH is rather limited [3, 7] and the use of botA for its treatment is generally not recommended.

The pathophysiology of headaches is multifaceted, and seems to consist of a combination of muscular contraction and central mechanisms that involve altered stimulus response function of second-order transmission neurons in the spinal cord or in the brain stem and is caused by a dysregulated endogenous pain control system.

We describe a case of a woman who received a cosmetic treatment with botA for fine lines in the frontal and glabellar area and experienced relief from subclinical headaches.

Case Report

A 32-year-old, otherwise healthy woman was treated for glabellar and frontal fine lines. Injection sites were marked before the procedure, and photos were taken before and 2 weeks after the procedure (Fig. 1). Injections of botA sites were 1 cm medial of the middle of the eyebrow (2×2 Allergan units [AU]), above the medial margin of the eyebrow (4×2 AU), in the glabellar area (2 AU), and in the frontal musculature (2×2 AU).

Vistabel 4 AU/0.1 mL (Botox®, Allergan) was used in all 18 AU. The patient reported a visible effect after 3 days. At follow-up after 2 weeks, the patient reported cosmetic satisfaction with reduction of fine lines. Incidentally, she noted that she had not had any headaches since the injections.

At 4 weeks, she described a complete absence of headaches and that she felt more relaxed during the day. When questioned about the headaches, she reported that she had not previously noted that she had headaches, and the quality and frequency of the headaches were difficult to describe exactly. She described the absence of a pressuring sensation on the right side of the head, located at the frontal region. Also, she noticed that she would routinely, out of habit, apply pressure with the fingers to the middle of the superior margin of the right orbit, probably due to the headaches. From her description, the headaches were subclinical and probably of a tension type. The frequency was probably high, as she had made it a habit to apply pressure to the middle of the superior margin of the right orbit. It is important to note that she had no other concomitant symptoms. The patient reported high satisfaction with the treatment, partly due to the cosmetic outcome, but mainly due to the

absence of headaches, and wishes to continue to receive treatment because of this unexpected beneficial side effect.

Discussion

The mode of action of botA on headaches is not yet completely understood. The botulinum toxin occurs in 7 serotypes (A–G), of which botA and more recently B are utilized for medical use. Its most apparent effect is the blockage of the release of acetylcholine at the neuromuscular junction subsequently producing local paralysis. Reversal of local paralysis initially occurs by neural sprouting with reinnervation of the muscle and ultimately by regeneration of the acetylcholine vesicle docking proteins [8], which restores function in 1–4 months. The reversal of pain relief is still not elucidated. The effect on headaches was initially thought to be due to the muscular relaxation. However, studies on temporomandibular disorder have shown that as muscular power returns to normal, patients still experience pain relief [9]. Also, the theory of muscle relaxation does not explain why and how the effects of botA are greater on CMH than on CTTH. Indeed, the muscular relaxation may indirectly contribute to the analgesic effects, but it seems that the mechanisms behind chronic muscular pain are not due to increased muscular activity [10], suggesting that the aetiology of CTTH at least in part is not muscular, and that botA probably acts on several levels. Animal models indicate that botA's antinociceptive properties lie in its interactions with the N-ethylamide-sensitive factor attachment receptor (SNARE) complex by blocking the synaptic vesicle fusion and inhibiting release of various pain-modulating neurotransmitters and inflammatory mediators, including glutamate, substance P, calcitonin gene-related peptide, and pain-sensing transmembrane receptors, such as transient receptor potential channels, on the neuronal plasma membrane [11]. This theory is supported by the subcutaneous injections of botA in rats, shown to significantly reduce formalin-induced nociceptive behaviour [12], demonstrating that botA inhibits inflammation-induced pain via glutamate and direct effects on nociceptive neurons at a peripheral level. From this, we could consider that an indirect analgesic action of botA may be due to the attenuated input to the central nervous system. Contributing to this could be reduced proprioceptive feedback through the inhibition of motor neurons in the muscle spindles, and indirectly by reduced physical stimulation of peripheral tissues resulting from reduced muscle tone [9]. The current notion is that botA inhibits peripheral signals to the CNS, which indirectly inhibits central sensitization [13].

Conclusion

In addition to the mechanical effects of botA, evidence suggests that its analgesic properties are complex, and the mechanical part only represents a fraction of its actions. Although the effect of botA on CTTH seems limited, several studies demonstrate its pain-modulating effects, and this property is worth paying attention to even in cosmetic procedures, as it has a potential beneficial effect which could affect quality of life positively as in the case described above.

Statement of Ethics

The first author, I.S., is also the proband of the case report and has given written informed consent to have this case published.

Disclosure Statement

The first author is the proband of the case report and has no other conflicts of interest. S.H.M. has no conflicts of interest.

Author Contributions

All authors read and approved the final manuscript.

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Fig. 1. **a** Injection sites marked before the procedure. **b** Two weeks after the procedure.