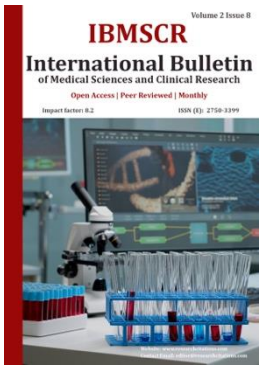

BOTULINUM TOXIN IN DENTISTRY: CURRENT APPLICATIONS AND FUTURE PERSPECTIVES

Shosaidova N.R.
Abdunazarova G.Zh.
Zokirov D.M.
Khusanova O.M.
Department of Hospital Dentistry, Tashkent State Dental Institute
Corresponding author: shosaidovan@mail.ru
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Abstract

Botulinum toxin type A (BoNT-A), a neuroparalytic agent produced by Clostridium botulinum, has found increasing utilization in various branches of medicine, including dermatology, neurology, ophthalmology, and more recently, dentistry. Owing to its mechanism of action — the inhibition of acetylcholine release at presynaptic terminals — BoNT-A induces temporary chemodenervation of targeted muscles. This property makes it a valuable adjunct in managing a range of functional and aesthetic conditions affecting the orofacial region. This review outlines the principal clinical indications, pharmacological action, injection protocols, contraindications, and potential adverse effects associated with BoNT-A in dental practice. Particular emphasis is placed on its use in the treatment of bruxism, temporomandibular joint disorders (TMD), sialorrhea, gummy smile, and trigeminal neuralgia. When applied in accordance with standardized guidelines, botulinum toxin offers a safe, effective, and minimally invasive alternative to conventional surgical or pharmacological interventions.

Clinical Indications for Botulinum Toxin Use in Dentistry

Bruxism

Bruxism is characterized by involuntary and excessive activation of masticatory muscles, typically during sleep or periods of psychological stress. Chronic hyperfunction of these muscles may result in the development of myofascial trigger points, hypertrophy of the masseter and temporalis muscles, and progressive damage to the dentition and periodontal tissues. Intramuscular administration of BoNT-A into the masticatory muscles has been shown to effectively reduce muscle tone, alleviate pain, and mitigate further functional deterioration. An additional benefit is the aesthetic improvement of the lower facial contour due to muscle volume reduction.

Sialorrhea

Sialorrhea, or excessive salivation, often arises secondary to neurodegenerative diseases such as Parkinson's disease or amyotrophic lateral sclerosis, and may also occur due to impaired oropharyngeal coordination. Targeted BoNT-A injections into the parotid and submandibular glands under ultrasound guidance reduce salivary flow by inhibiting cholinergic stimulation of the acini. Therapeutic onset is typically observed within 5–7 days and lasts up to 16 weeks.

Temporomandibular Joint Dysfunction (TMD)

TMD is frequently associated with increased muscle tone and spasm in the masticatory apparatus, leading to pain, restricted mandibular movement, and joint dysfunction. Targeted administration of BoNT-A into the masseter, temporalis, and lateral pterygoid muscles

facilitates muscle relaxation, restores joint mobility, and reduces symptom severity. The clinical effect generally persists for 3 to 6 months.

Gummy Smile (Excessive Gingival Display)

A hyperactive upper lip elevator complex — particularly the levator labii superioris alaeque nasi — can result in excessive gingival exposure during smiling, representing an aesthetic concern. Localized BoNT-A injections into the implicated muscle temporarily weaken its activity, thereby reducing gingival display and improving smile harmony. The effect typically endures for 4–6 months.

Trigeminal Neuralgia

Trigeminal neuralgia presents with paroxysmal, severe facial pain, significantly impairing patients' quality of life. In addition to conventional treatment modalities such as anticonvulsants and nerve blocks, BoNT-A injections into identified trigger zones have been shown to reduce pain intensity and frequency, offering a non-systemic alternative with minimal side effects.

Contraindications

Before initiating BoNT-A therapy, the following conditions should be excluded:

- Myasthenia gravis or other neuromuscular transmission disorders
- Coagulopathies or use of anticoagulant therapy (e.g., hemophilia)
- Pregnancy and lactation
- Local infections or inflammation at the injection site
- Hypersensitivity to botulinum toxin or any component of the formulation

Potential Adverse Effects

Although BoNT-A is generally well tolerated, adverse effects may occur, most of which are transient and self-limiting:

- Local hematoma or bruising
- Mild transient dysarthria or changes in facial expression
- Difficulty swallowing (if administered near pharyngeal musculature)
- Fatigue of masticatory muscles

Adherence to validated clinical protocols, proper injection technique, and individualized dose adjustment significantly reduce the risk of complications.

Conclusion

The incorporation of botulinum toxin into dental practice represents a significant advancement in the management of both functional and aesthetic orofacial conditions. Its minimally invasive nature, combined with a favorable safety profile, makes BoNT-A an indispensable tool in modern dental therapeutics. Continued research and refinement of clinical protocols will further expand its indications and optimize patient outcomes.