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Botulinum Toxin in Facial Nerve Paralysis

A Systematic Review of Literature

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Botulinum Toxin for Treating Temporomandibular Disorders: What is the Evidence?

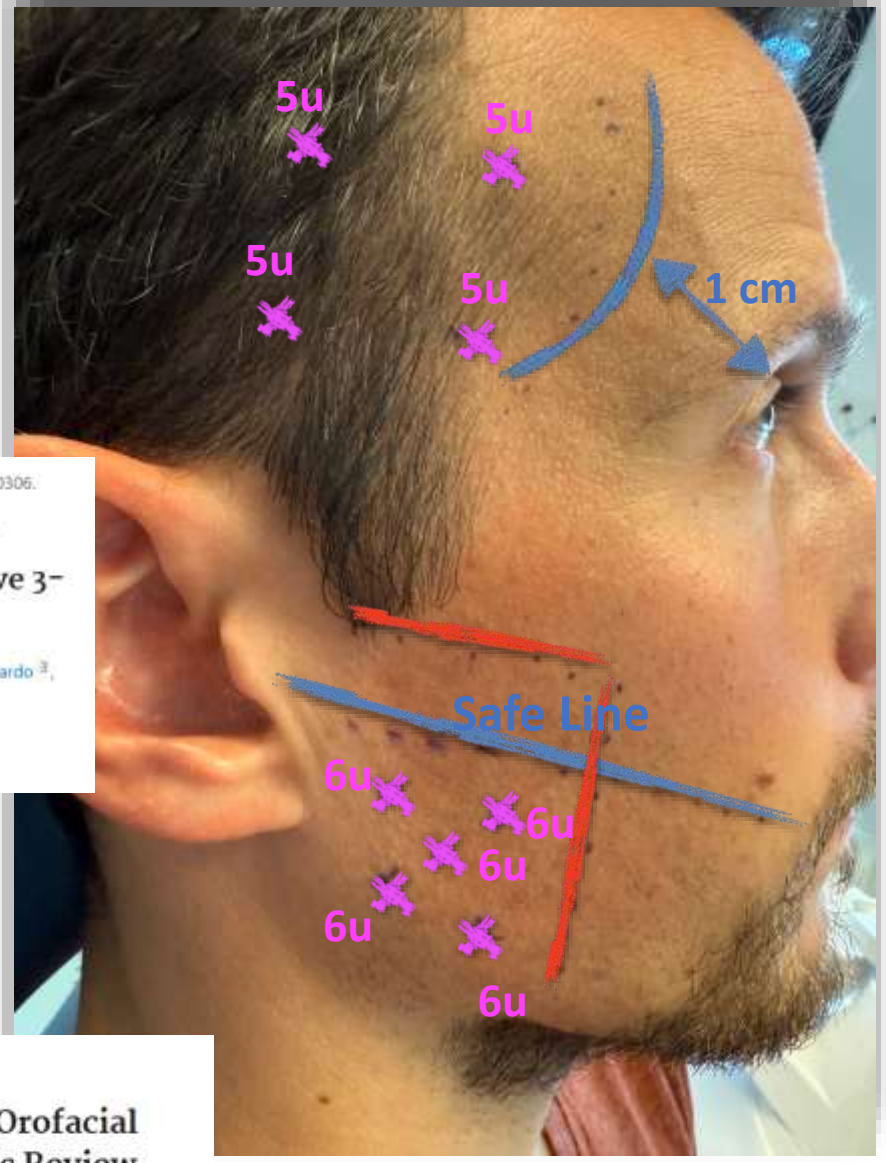
Review > Dent Med Probl. 2026 May-Jun;63(3):833-841. doi: 10.17219/dmp/216146

Botulinum toxin injections into masticatory muscles: A brief review on applications in dental occlusion management for orthognathic surgery and facial fractures

Matteo Val [1,2], Mirko Ragazzo [2], Gabriele Monarchi [2], Margherita Gobbo [2], Sara Marangoni [2], Luca Guarda-Nardini [2]

Affiliations + expand

PMID: 42544598 DOI: 10.17219/dmp/216146



Observational Study > Toxins (Basel). 2026 Jul 15;18(7):306. doi: 10.3390/toxins18070306.

Masseter Muscle Morphometric Changes After Botulinum Toxin Type A Injection: A Prospective 3-Month Study

Matteo Val [1,2], Ludovica Zucchini [3], Matteo Pollis [2], Luca Guarda-Nardini [1], Luca Lombardo [3], Daniele Manfredini [2], Anna Colonna [2,3]

Affiliations + expand

PMID: 42506726 PMCID: PMC13417228 DOI: 10.3390/toxins18070306

toxins MDPI

> Toxins (Basel). 2024 Aug 16;16(8):364. doi: 10.3390/toxins16080364

Intramuscular Botulinum Toxin as an Adjunct to Arthrocentesis Viscosupplementation in Temporomandibular Disorders: A Proof Concept Case–Control Investigation

Luca Guarda Nardini [1], Daniele Manfredini [2], Anna Colonna [2], Edoardo Ferrari Cagidiaco [2], Marco Ferrari [2], Matteo Val [2,*]

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PMCID: PMC11359951 PMID: 39195774

Editorial > Cranio. 2026 Jul;44(4):621-624. doi: 10.1080/08869634.2026.2669199. Epub 2026 May 8.

Botulinum toxin in orofacial pain: A clinician's perspective on what we know, what we do, and what we get wrong

Matteo Val [1,2], Daniele Manfredini [1], Luca Guarda Nardini [2]

Affiliations + expand

PMID: 42099274 DOI: 10.1080/08869634.2026.2669199

> Toxins (Basel). 2023 Sep 1;15(9):541. doi: 10.3390/toxins15090541.

Is Botulinum Toxin Effective in Treating Orofacial Neuropathic Pain Disorders? A Systematic Review

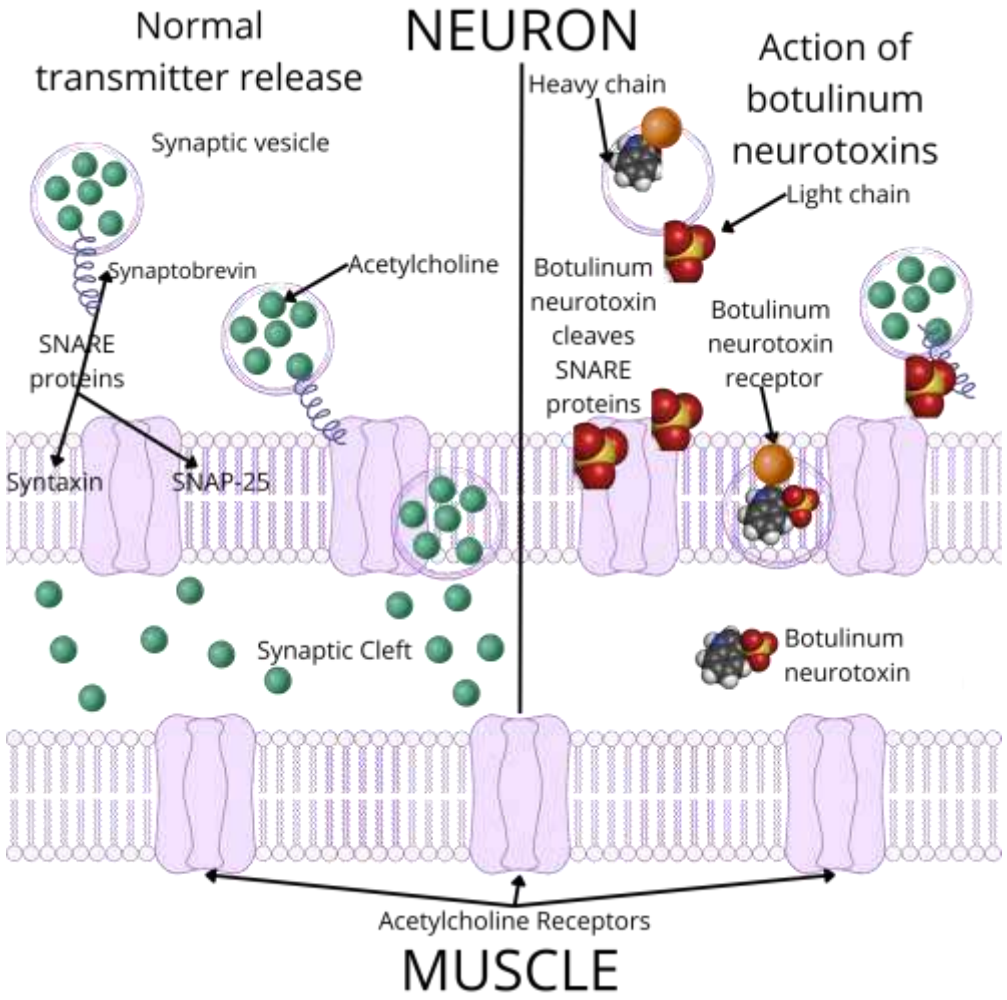
Matteo Val [1], Robert Delcanho [2], Marco Ferrari [1], Luca Guarda Nardini [3], Daniele Manfredini [1]

Affiliations + expand

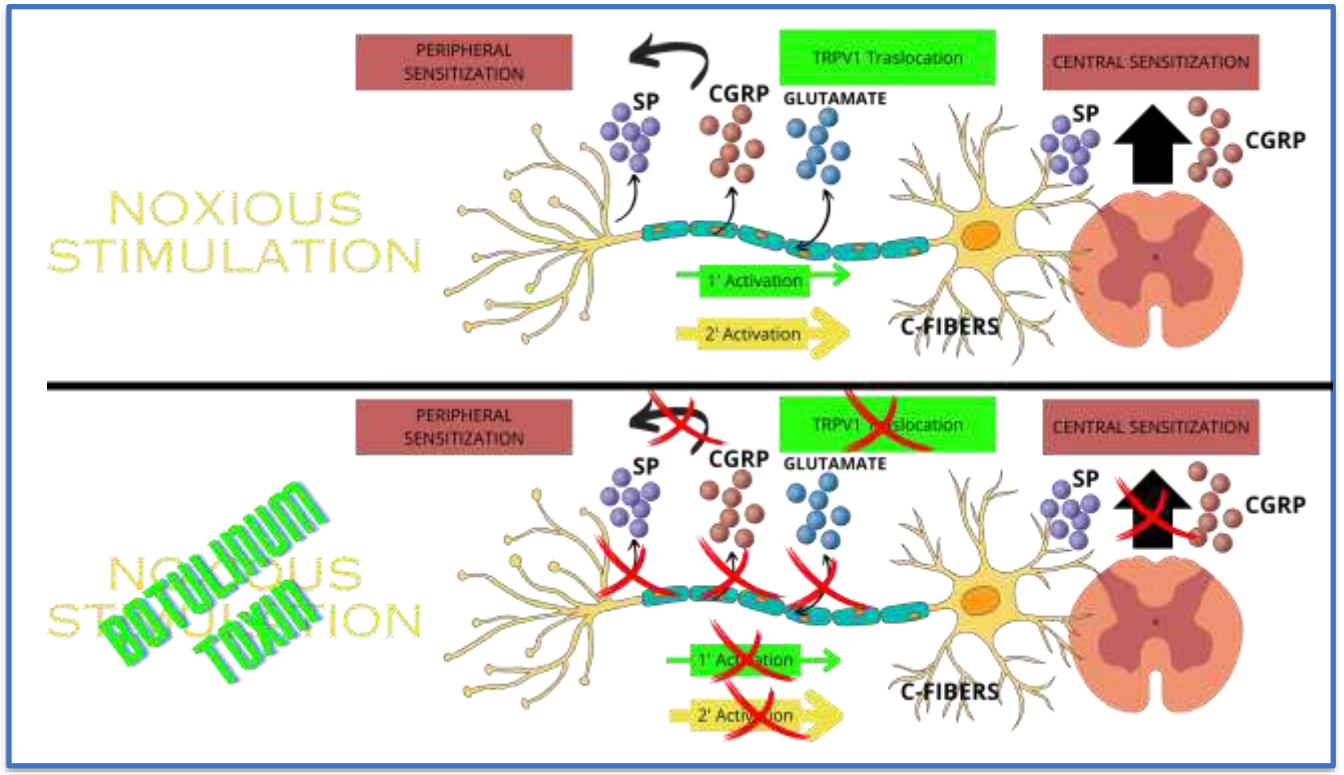
PMID: 37755967 PMCID: PMC10535201 DOI: 10.3390/toxins15090541

Botulinum Toxin

MUSCLE PARALYSIS
Neuromuscolar junction



PAIN MODULATION
Reduction in secretion of neurotransmittors



Facial Nerve Paralysis . Background & Rationale

20–30

cases / 100,000 / yr

Bell's palsy incidence

~20%

do NOT fully recover

esp. complete/prolonged palsy

~10%

develop synkinesis

often > disabling than palsy

- Etiologies: idiopathic, traumatic, neoplastic, infectious , congenital
- Sequelae (synkinesis) frequently more disabling than the initial paralysis
- Acute phase → corticosteroids / antivirals.
- Chronic phase → adjunctive therapy needed
- **Botulinum toxin (BoNT-A): cornerstone of chronic-phase management**

Facial nerve (CN VII) branches & distribution

de Lima P.N., Gusmão R.M., Siqueira N.C.G., Varejão L.C. Toxina botulínica como alternativa no tratamento da paralisia facial de Bell: revisão de literatura. Braz J Dev, 2020. • Hohman M.H., Lee L.N., Hadlock T.A. Two-step highly selective neurectomy for refractory periocular synkinesis. Laryngoscope, 2013. • International Head and Neck Scientific Group. Pathogenesis, diagnosis and therapy of facial synkinesis: a systematic review and clinical practice recommendations. 2022. • Shawly H. et al. Surgical treatment of acute and chronic facial paralysis. J Healthc Sci, 2023.

HOW CAN WE HELP PATIENTS WITH FACIAL NERVE PARALYSIS?

Comparative Effectiveness: Alternative & Adjunct Treatments

Facial Exercise Therapy

First-line for post-paralytic synkinesis

854 patients across 19 studies (7 RCTs)

4/7 high-quality RCTs: positive effect

K. AJ et al., 2022

Selective Neurectomy

Refractory periocular synkinesis, unresponsive

to BoNT-A + rehabilitation

Two-step technique — no lagophthalmos/ectropion

Hohman et al., 2013

Microsurgical Reanimation (Free Flap)

Long-standing / irreversible palsy (>12 months)

Gracilis free-muscle transfer: gold-standard dynamic smile

Neurotization: cross-facial graft vs masseteric vs dual

Bayezid et al., 2023 (n=435) · ~9.6% complication rate (Garcia et al., 2015)

K. AJ et al. Physical therapy for facial nerve paralysis (Bell's palsy): an updated and extended systematic review of facial exercise therapy. 2022. • Hohman M.H., Lee L.N., Hadlock T.A. Two-step highly selective neurectomy for refractory periocular synkinesis. Laryngoscope, 2013. • Casazza G.C., Schwartz S., Gurgel R. Systematic review of facial nerve outcomes after middle fossa and transmastoid decompression for Bell's palsy with complete facial paralysis. Otol Neurotol, 2018. • Bayezid K.C., Joukal M., Karabulut E., Macek J., Moravcová L., Streit L. Donor nerve selection in free gracilis muscle transfer for facial reanimation: a systematic review and meta-analysis. J Plast Reconstr Aesthet Surg, 2023;82:31–47. • Garcia R.M., Gosain A.K., Zenn M.R., Marcus J.R. Early postoperative complications following gracilis free muscle transfer for facial reanimation: a systematic review and pooled data analysis. J Reconstr Microsurg, 2015;31(8):558–564.

A staged, multidisciplinary ladder: rehabilitation / BoNT-A → selective neurectomy / decompression → microsurgical free-flap reanimation for irreversible palsy

Clinical Indications BTX & Key Evidence

Hemifacial Spasm

Excellent primary indication

Post-Paralytic Synkinesis

2nd-line after PHYSIOTHERAPY

Post-Neurosurgical Palsy

e.g. after vestibular schwannoma resection

Bell's Palsy / Acute

Limited acute role — mainly residual asymmetry

1,220

patients, German multidisciplinary series — p<0.001 motor function

Steinhäuser et al., 2022

73–98.4%

efficacy in hemifacial spasm across 23 studies (1991–2021)

Tambasco et al., 2021

5 years

sustained efficacy — no dose escalation required

Akulov et al., 2024

Underutilized in practice: only 0.1–0.8% of facial-palsy patients receive BoNT-A within 2 years of diagnosis — Shokri et al., 2020

Clinical relevance:
residual facial asymmetry

Steinhäuser J. et al. Multidisciplinary care of patients with facial palsy: treatment of 1,220 patients in a German facial nerve center. J Clin Med, 2022. • Tambasco N., Filidei M., Nigro P., Parnetti L., Simoni S. Botulinum toxin for the treatment of hemifacial spasm: an update on clinical studies. Toxins, 2021. • Akulov M., Orlova O., Shimansky V., Tanyashin S., Poshataev V., Zakharov V. Five-year follow-up after neurosurgery complicated by facial neuropathy. Vopr Neirokhir Im N N Burdenko, 2024. • Shokri T., Saadi R., Schaefer S.D., Lighthall J.G. Trends in the treatment of Bell's palsy. Facial Plast Surg, 2020.

Injection Technique & Dosing

Paretic side → minimize denervation | Contralateral → reduce hyperactivity

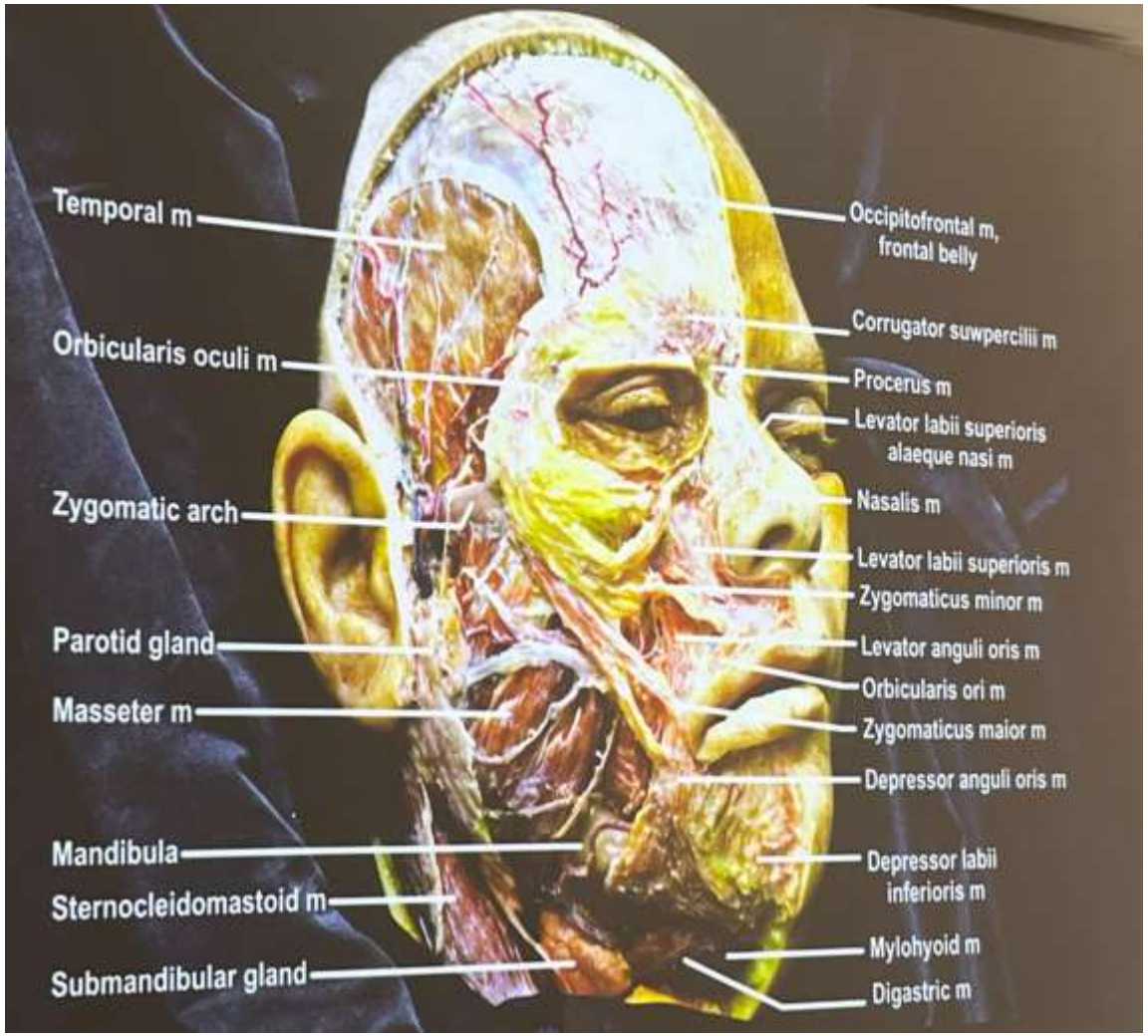
Target muscles: orbicularis oculi · zygomaticus maj./min. · levator & depressor anguli oris

OnaBoNT-A	AboBoNT-A	IncoBoNT-A
(Botox®)	(Dysport®)	(Xeomin®)
20–60 U	**50–150 U**	**16–40 U**
per muscle group	3:1 potency ratio	per muscle group

Localization technique

Palpation → EMG-guided → Ultrasound-guided

Over-injection → paralyzed appearance. Goal: optimal dose, not maximal dose.



de Sanctis Pecora C., Shitara D. Botulinum toxin type A to improve facial symmetry in facial palsy: a practical guideline and clinical experience. Toxins, 2021. • Field M. et al. AbobotulinumtoxinA (Dysport), OnabotulinumtoxinA (Botox) and IncobotulinumtoxinA (Xeomin) neurotoxin content and implications for duration of response. Toxins, 2018.

Safety Profile & Formulation Switching

Common / Local Advers Events

Injection-site pain, ptosis, lagophthalmos — incidence ≈ 0% when safety zones respected

Serious Advers Events (rare)

Systemic botulism only with excess doses (Egypt 2017: 200–300 IU vs 20–60 IU therapeutic)

Immunogenicity

Neutralizing antibodies in 10–15% with repeated injections; only 2.6% require formulation switch

Contraindications

NMJ disorders (myasthenia gravis), concurrent aminoglycosides, pregnancy

Switching formulation (e.g. to IncoBoNT-A) restores efficacy in ~80–90% of antibody-positive patients

Witmanowski H., Błochowiak K. The whole truth about botulinum toxin — a review. Adv Dermatol Allergol, 2019. • Rashid E.A.M.A., El-Mahdy N.M., Kharoub H.S., Gouda A.S., El-Nabarawy N.A., Mégarbane B. Iatrogenic botulism outbreak in Egypt due to a counterfeit botulinum toxin A preparation. Basic Clin Pharmacol Toxicol, 2018. • Hohman M.H., Lee L.N., Hadlock T.A. Two-step highly selective neurectomy for refractory periocular synkinesis. Laryngoscope, 2013.

Conclusions

- Evidence-supported, effective, safe adjunct — especially post-paralytic synkinesis & persistent asymmetry
- Best integrated within a multidisciplinary framework: rehabilitation first-line, BoNT-A second-line / combination
- Dual mechanism — peripheral Neuromuscolar junction blockade + central modulation of the central nervous system
- Consistent efficacy across etiologies; benefit sustained to 5 years, no dose escalation
- **Research priorities: standardized protocols, RCTs, cost-effectiveness data**

Steinhäuser J. et al. Multidisciplinary care of patients with facial palsy: treatment of 1,220 patients in a German facial nerve center. J Clin Med, 2022. • Tambasco N., Filidei M., Nigro P., Parnetti L., Simoni S. Botulinum toxin for the treatment of hemifacial spasm: an update on clinical studies. Toxins, 2021. • Bayezid K.C., Joukal M., Karabulut E., Macek J., Moravcová L., Streit L. Donor nerve selection in free gracilis muscle transfer for facial reanimation: a systematic review and meta-analysis. J Plast Reconstr Aesthet Surg, 2023;82:31–47.

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Thanks for your Attention.

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