Botulinum Toxin for Orofacial Pain

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Oral Medicine Specialist

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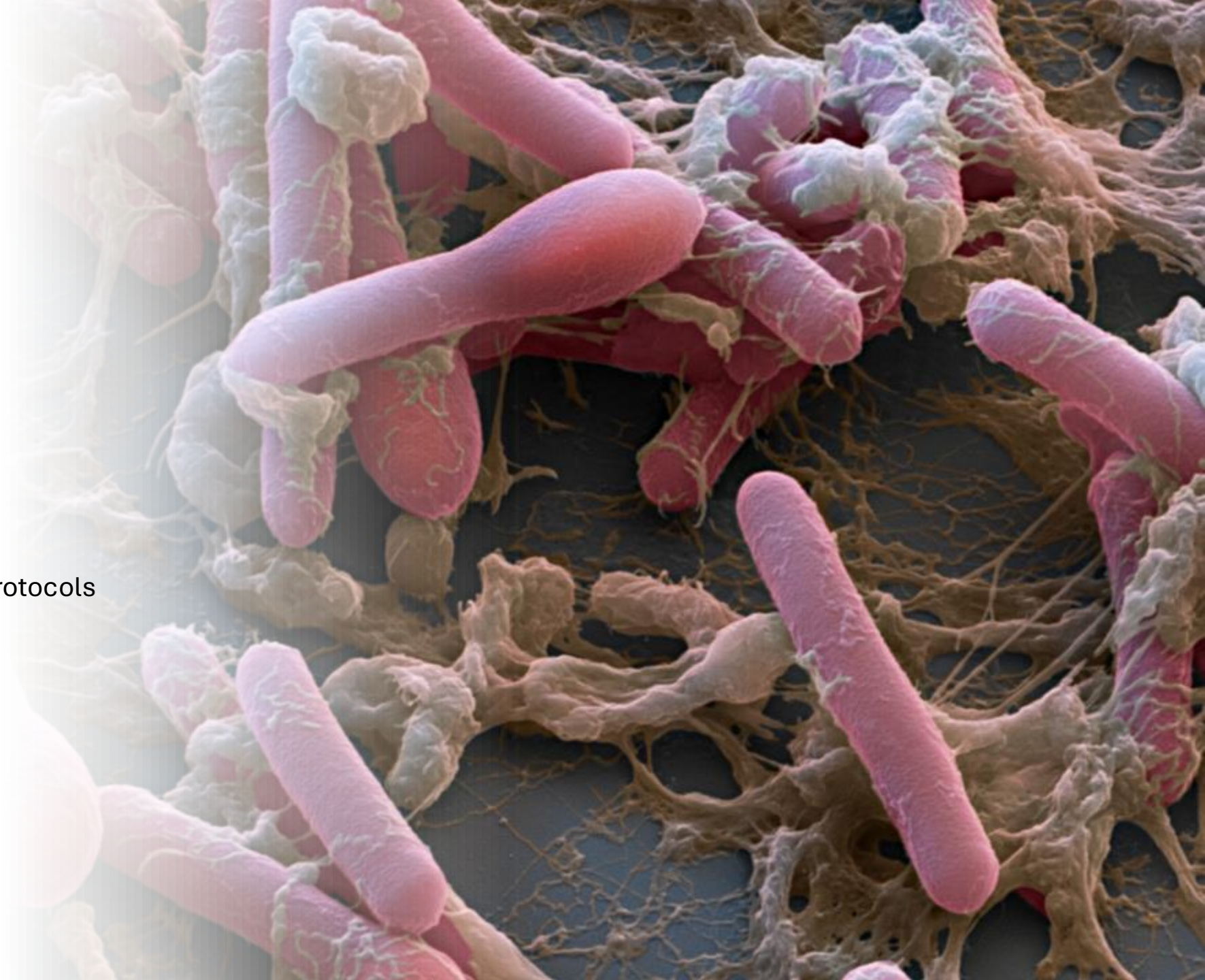
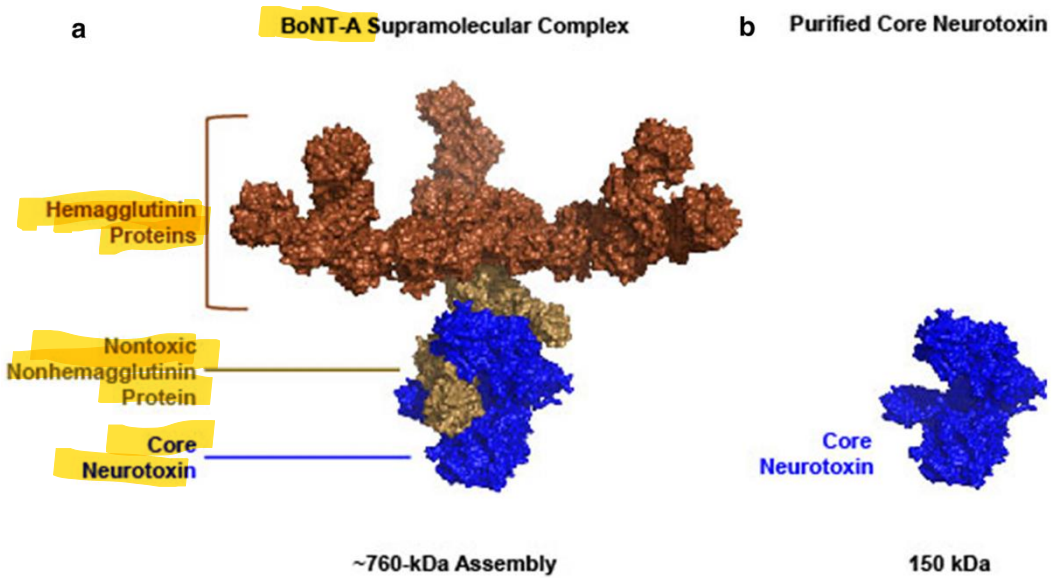
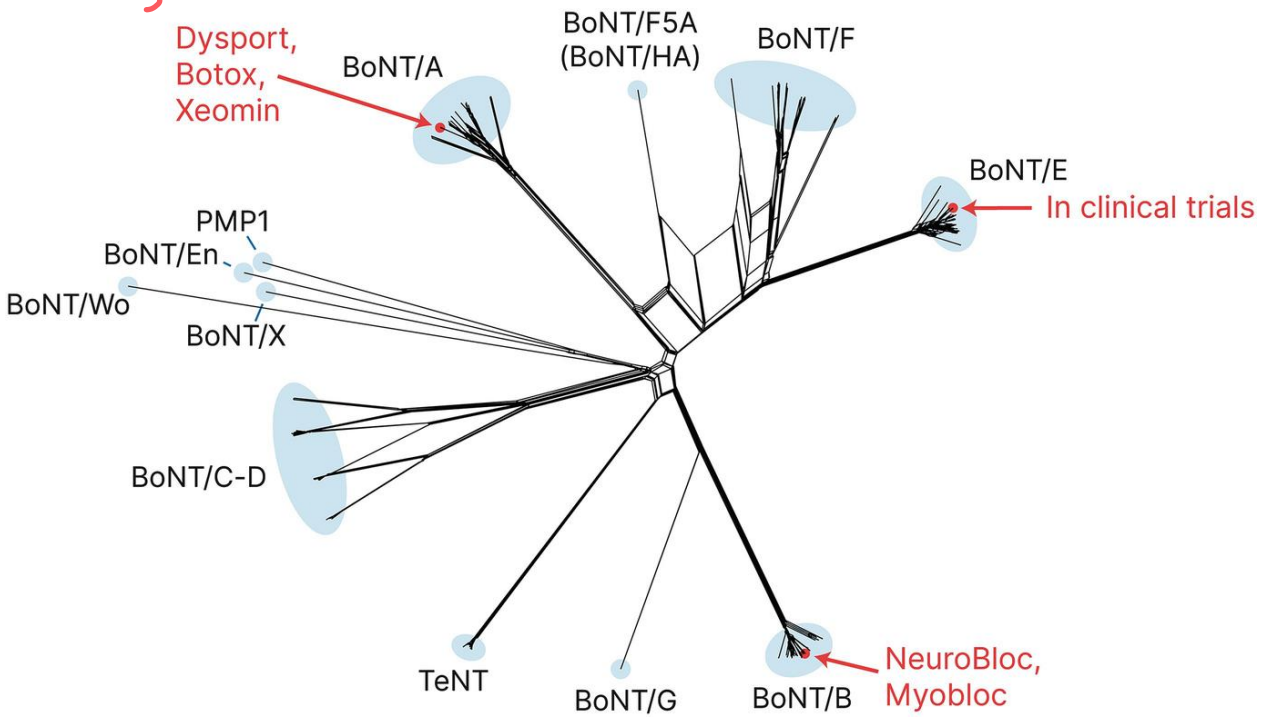


BoNT- Overview



(Carr et al., 2021)

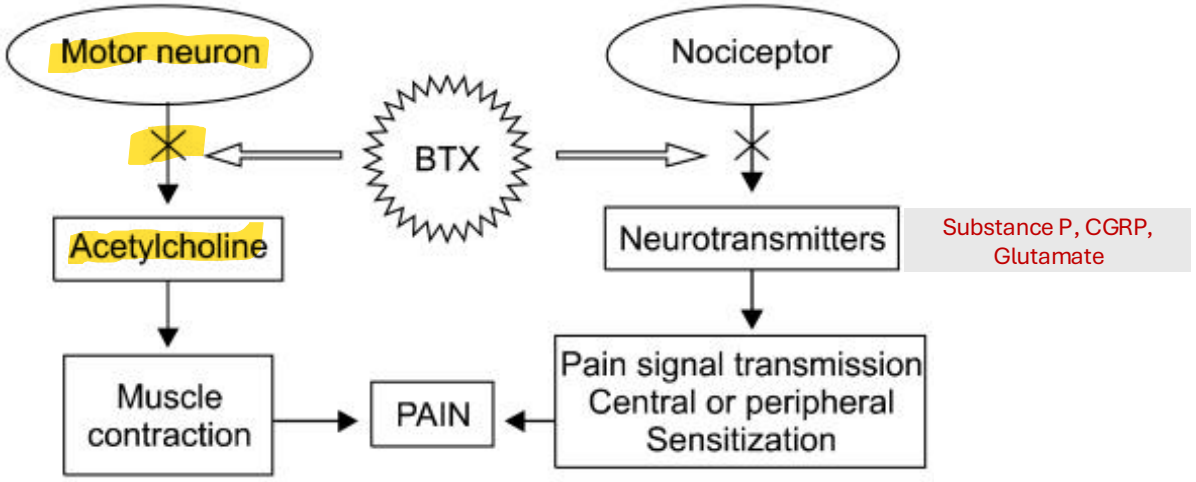
Brand names



(Dong & Stenmark, 2019)

Newjn process of approval

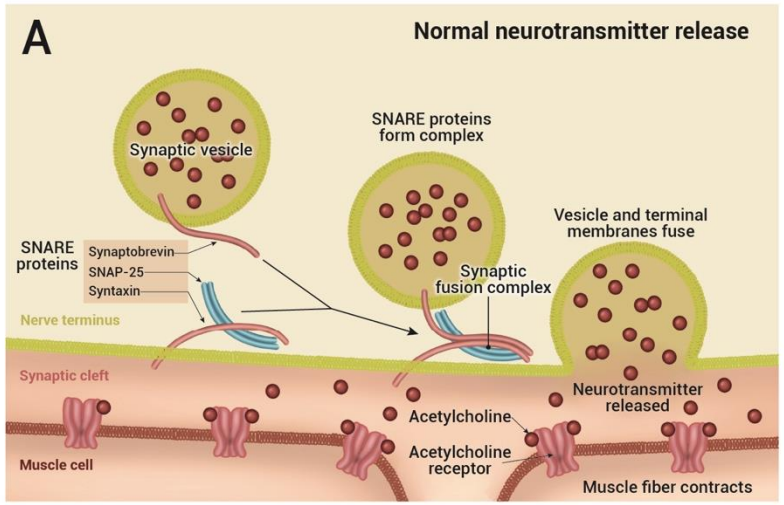
BoNT- Mechanism of Action

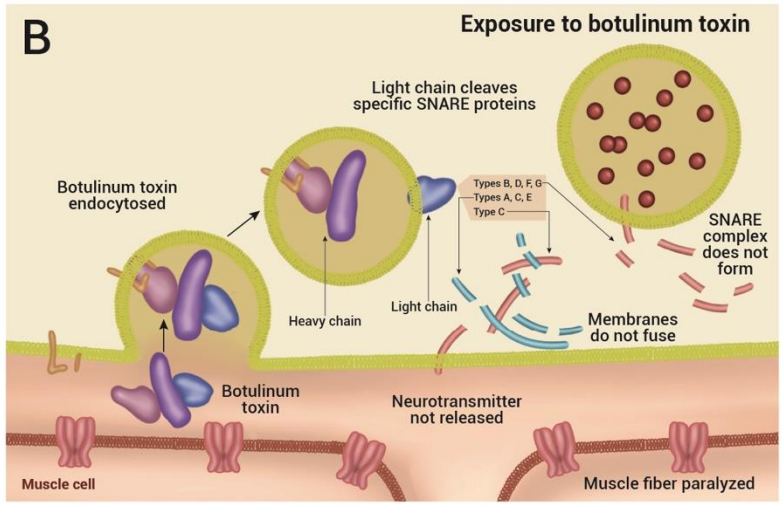


(Sim 2011)

Last ~3 months

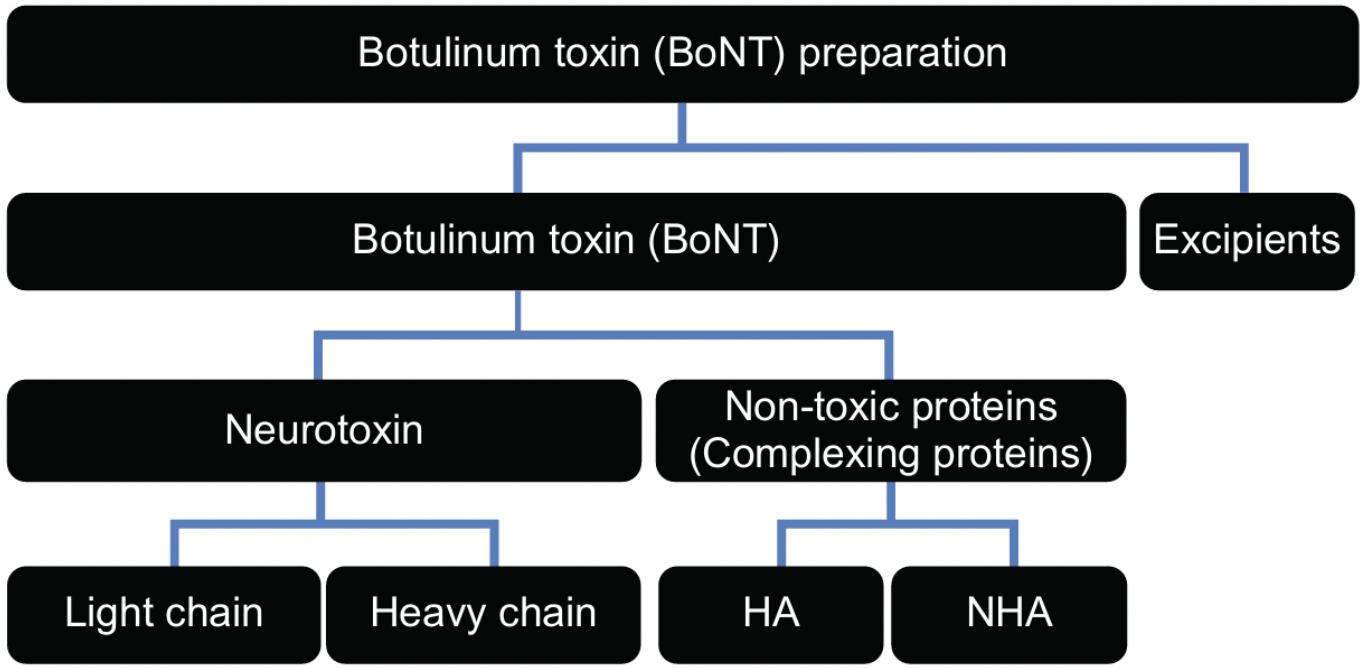
(1) Endocytosis of botulinum toxin.
(2) Cleavage of light chain of botulinum toxin.
(3) The light chain cleaves SNARE proteins.
(4) Prevents exocytosis of ACh into synaptic cleft.
(5) Temporary paralysis of targeted muscle fibres.





www.openanesthesia.org/

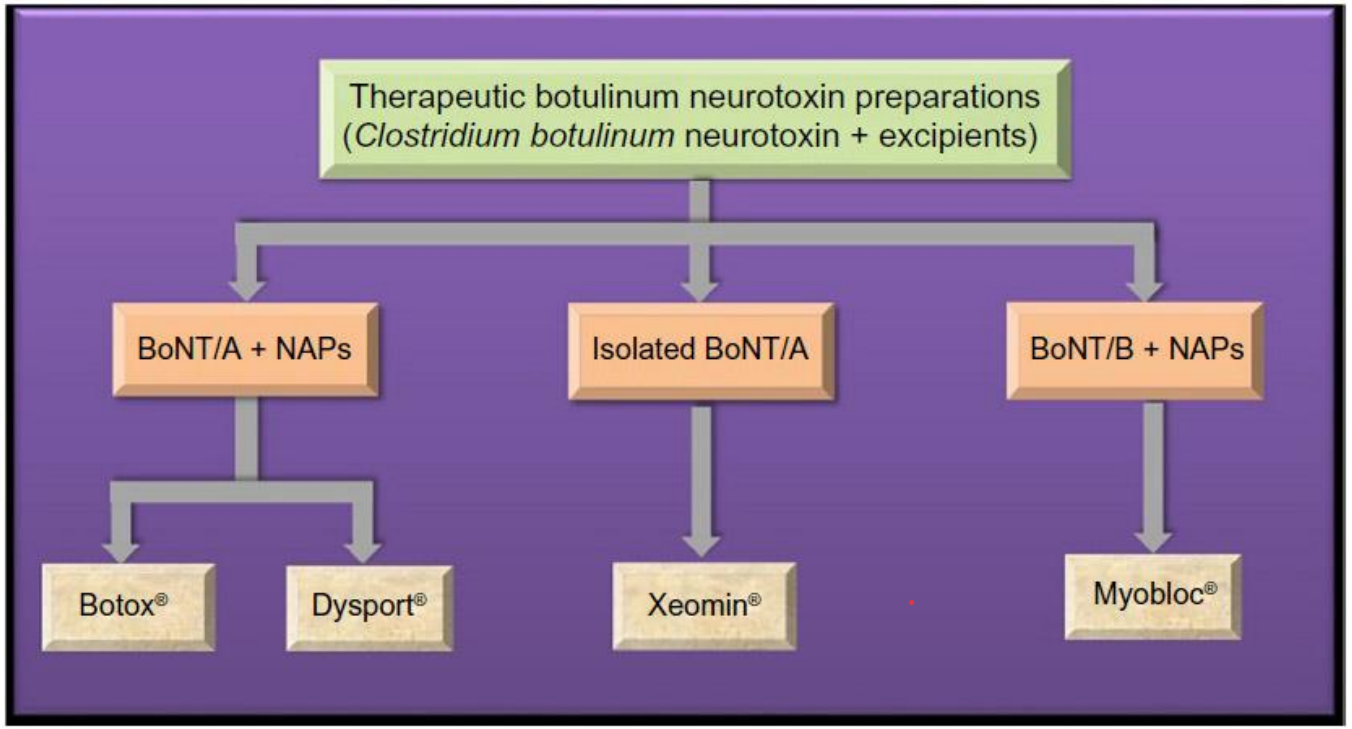
BoNT Preparations



Contents of botulinum toxin preparation.

Abbreviations: HA, Hemagglutinin; NHA, Non-Hemagglutinin

Park J, Lee MS, Harrison AR. Profile of Xeomin®(incobotulinumtoxinA) for the treatment of blepharospasm. Clinical Ophthalmology. 2011 Jun 1:725-32.



Kukreja et al., 2015

Abbreviations: BoNT/A: botulinum neurotoxin type A, NAPs: neurotoxin-associated proteins, BoNT/B: botulinum neurotoxin type B.

Kukreja R, Singh BR. The botulinum toxin as a therapeutic agent: molecular and pharmacological insights. Research and Reports in Biochemistry. 2015 Dec 8:173-83.

Australian Government

Department of Health and Aged Care

Therapeutic Goods Administration

AUSTRALIAN PRODUCT INFORMATION
DYSPORT
***clostridium botulinum* type A toxin - haemagglutinin complex**
powder for injection vial

Abobotulinumtoxin A
Ipsen-Pharma, Berkshire, **UK**

AUSTRALIAN PRODUCT INFORMATION – BOTOX® (BOTULINUM TOXIN TYPE A) POWDER FOR INJECTION

Onabotulinumtoxin A
Allergan, Irvine, CA, **USA**

Incobotulinumtoxin A
Merz Pharma, Frankfurt am Main, **Germany**

AUSTRALIAN PRODUCT INFORMATION – XEOMIN®
(incobotulinumtoxinA) powder for solution for injection

There are currently three botulinum toxin agents with TGA registration (Botox®, Dysport® and Xeomin®). Each has undergone a separate evaluation of its safety and efficacy by the TGA as they are neither bioequivalent, nor dose equivalent.

- Biologic activity = MU (mouse units)
- Proprietary brand unit)

Based on prior studies on movement disorders, ratios often used in clinical practice:

- onabotulinumtoxinA:incobotulinumtoxinA = 1:1 (Yoshida 2022, Anadan & Jankovic 2021, Jankovic 2017)
- onabotulinumtoxinA: abobotulinumtoxinA = 1:2.5
- onabotulinumtoxinA:rimabotulinumtoxinB = 1:50

The potency labelling of ONA and INCO may be compared with a conversion factor of 1:1 (Dressler et al. 2012, 2014, 2018). Conversion factors between ONA/INCO and other BT drugs are still controversial. (Dressler 2021)

Yoshida K. Botulinum toxin therapy for oromandibular dystonia and other movement disorders in the stomatognathic system. Toxins 2022; 14: 282 [Internet].

Anandan C, Jankovic J. Botulinum toxin in movement disorders: an update. Toxins. 2021 Jan 8;13(1):42.

Jankovic J. Botulinum toxin: State of the art. Movement Disorders. 2017 Aug;32(8):1131-8.

Dressler D, Altavista MC, Altenmueller E, Bhidayasiri R, Bohlega S, Chana P, Chung TM, Colosimo C, Fheodoroff K, Garcia-Ruiz PJ, Jeon B. Consensus guidelines for botulinum toxin therapy: general algorithms and dosing tables for dystonia and spasticity. Journal of Neural Transmission. 2021 Mar;128:321-35.

Article

Clinical use of botulinum toxin

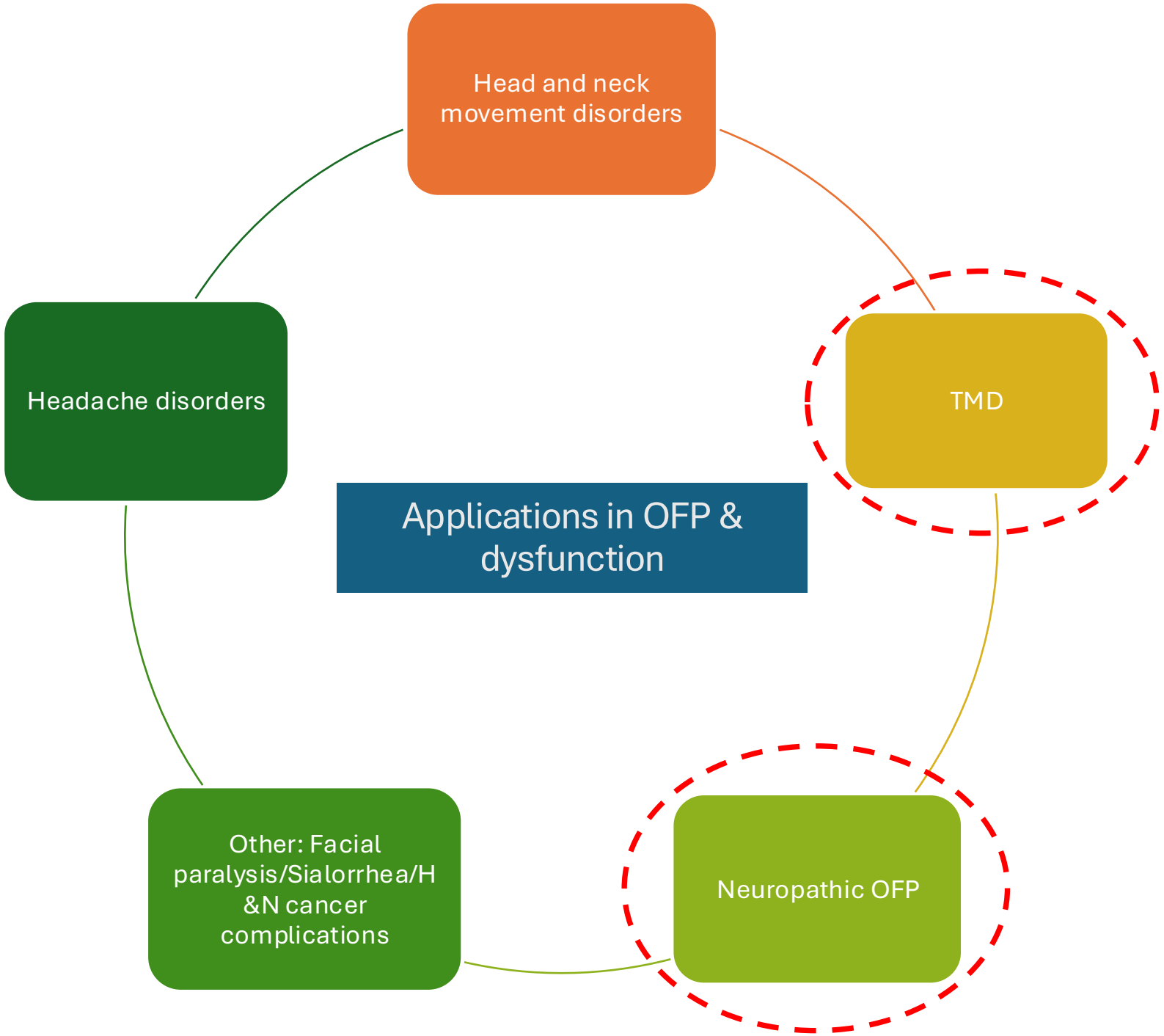
Adam Scheinberg

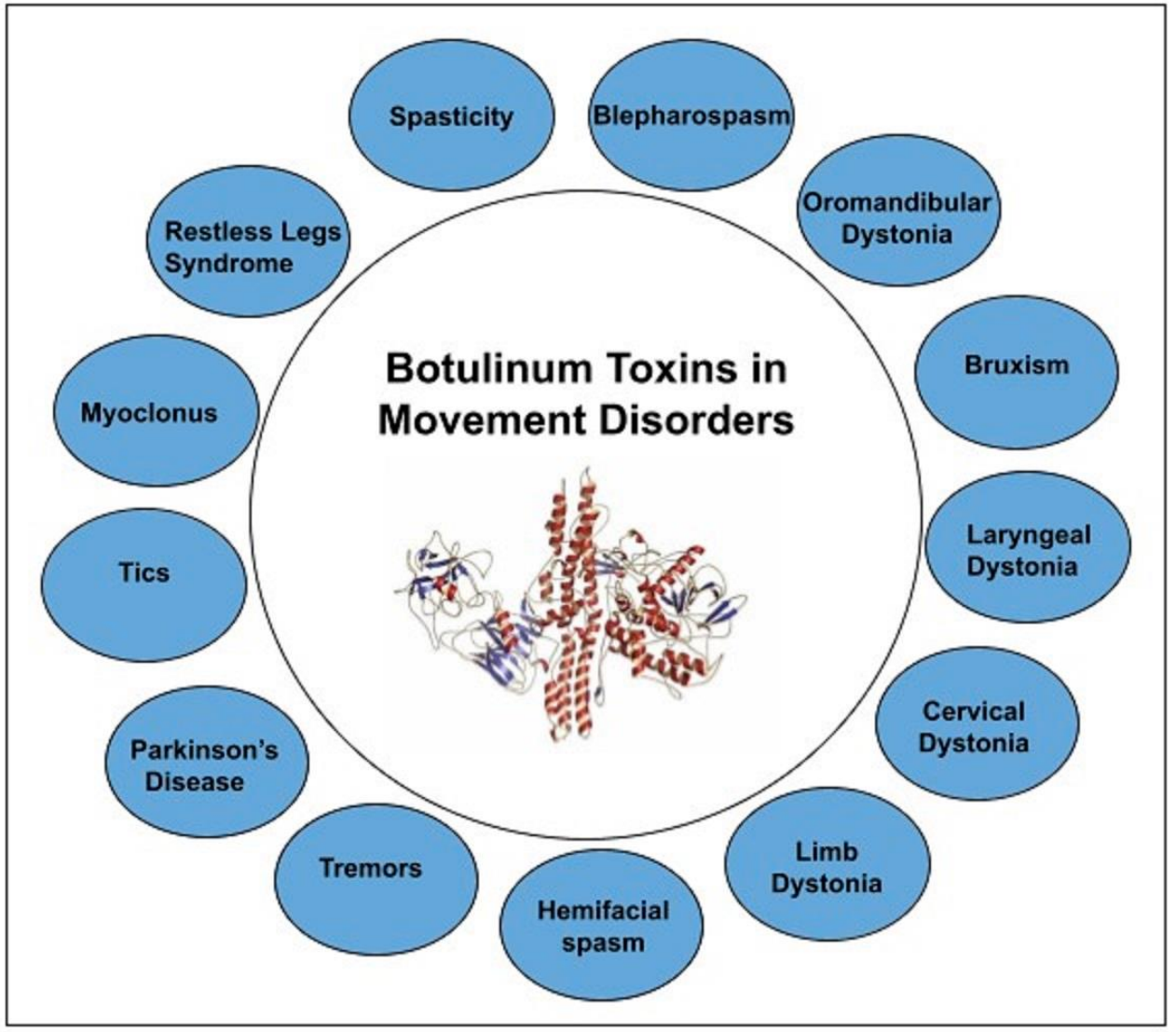
Aust Prescr 2009;32:39-42 | 1 April 2009 | DOI: 10.18773/austprescr.2009.020

- Diluted with 0.5-5 mL saline per vial prior to injection.
  - condition being treated
  - size of the muscle
  - risk of spread beyond the muscle
  - effect of previous injection courses
  - methods used to determine the injection site.

- Localisation of muscle/gland to be injected:
  - Palpation and anatomical landmarks
  - Electrical stimulation
  - Electromyography
  - Ultrasound
  - Combinations

Scheinberg A. Clinical use of botulinum toxin. Aust Prescr 2009;32:39-42


Head and neck movement disorders
TMD
Neuropathic OFP
Other: Facial paralysis/Sialorrhea/H&N cancer complications
Headache disorders
Applications in OFP & dysfunction

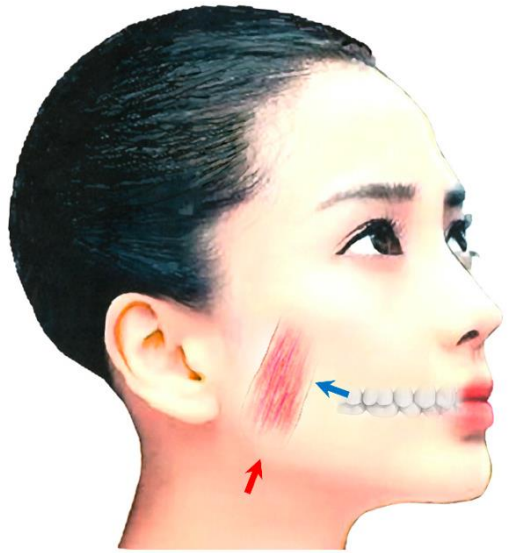


Anandan & Jankovic, 2021

Anandan C, Jankovic J. Botulinum toxin in movement disorders: an update. Toxins. 2021 Jan 8;13(1):42.

Oromandibular Dystonia

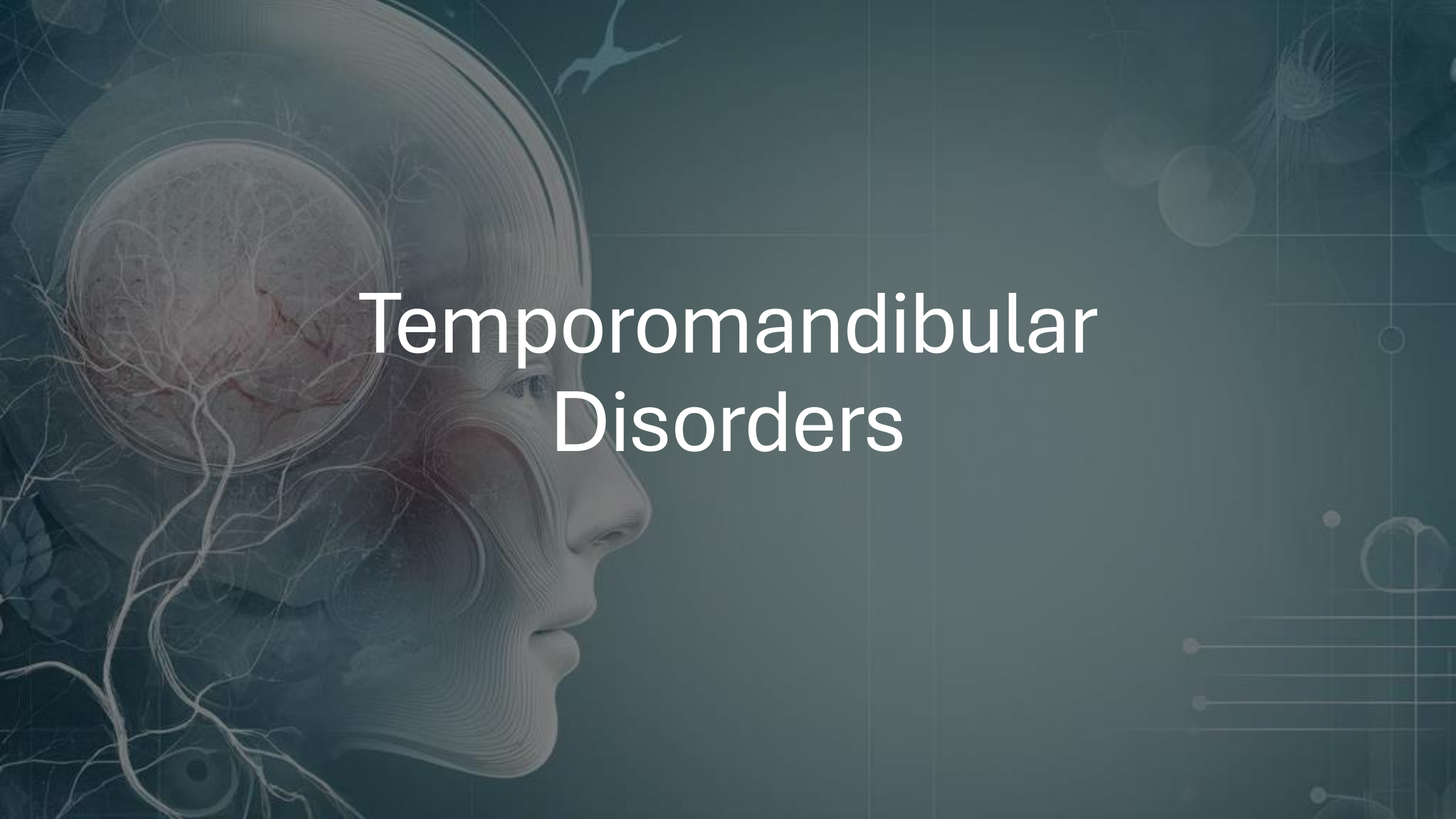
Injection sites for the masseter and temporalis muscles



Injection methods for the medial pterygoid muscle; intraoral approach (blue arrow) and extraoral oral approach (red arrow)

Injection methods for the lateral pterygoid muscle: intraoral approach (blue arrow) and extraoral oral approach (red arrow)

Yoshida K. Botulinum toxin therapy for oromandibular dystonia and other movement disorders in the stomatognathic system. Toxins. 2022 Apr 14;14(4):282.



Temporomandibular Disorders

Muscular TMD

Journal of Oral Rehabilitation. 2024

Effect of botulinum toxin type A on muscular temporomandibular disorder: A systematic review and meta-analysis of randomized controlled trials

Kaiyang Li[1] | Kenneth Tan[1] | Alexandra Yacovelli[1] | Wei Guang Bi[2]

- BTX- A ↓ pain intensity.
- Improvement in range of movement.
- Decreased masseter muscle intensity (μV) & occlusal force (kg).

- Currently no consensus on optimal dosage of BTX-A in pain mx.

Conclusions: BTX-A is a safe and effective treatment for reducing pain and improving temporomandibular muscle and joint function in muscular TMD patients. A bilateral dose of 60–100 U might be an optimal choice for treating muscular TMD pain.

* ↓ muscle contraction
* Analgesic effect

British Journal of Oral and Maxillofacial Surgery. 2020

Review

Botulinum toxin in the management of temporomandibular disorders: a systematic review

S. Thambar[a,b,c,*], S. Kulkarni[c], S. Armstrong[a], D. Nikolarakos[a]

Conclusion

We have found variation in the study designs, inconsistent reporting on assessment tools, and heterogeneous study groups. Overall, the level of bias was moderate to high, making the evidence moderate to low. Despite showing benefits, clear consensus is lacking on the therapeutic benefit of BTX in the management of myofascial TMD. Further RCT with minimal bias, larger sample sizes, and longer follow-up periods are now needed. We must find the optimal target site and dose, conduct feasibility tests for the cost of BTX, and find out whether the benefit:cost ratio is clinically acceptable. Nevertheless, this review has shown that in patients with myofascial TMD who have had at least three months' appropriate conservative management, BTX can improve outcomes.

Li K, Tan K, Yacovelli A, Bi WG. Effect of botulinum toxin type A on muscular temporomandibular disorder: A systematic review and meta-analysis of randomized controlled trials. Journal of Oral Rehabilitation. 2024 May;51(5):886-97.

Thambar S, Kulkarni S, Armstrong S, Nikolarakos D. Botulinum toxin in the management of temporomandibular disorders: a systematic review. British Journal of Oral and Maxillofacial Surgery. 2020 Jun 1;58(5):508-19.

TMJ dislocation

b Articular TMDs

J Stomatol Oral Maxillofac Surg, 2024

Original Article

IncobotulinumtoxinA in refractory temporomandibular disorder due to disk dislocation: A prospective study

Eduardo Freitas Ferreira[a,*], Alexandre Camões-Barbosa[b]

- Tx with EMG or ultrasound guided injection of incobotulinumtoxin A:
  - 20 U into each masseter & 20U in each L pterygoid m.
  - 1 point injected per muscle. Inj. bilaterally.
- ↓ in pain & ↓ in max unassisted mouth opening.

British Journal of Oral and Maxillofacial Surgery, 2010

Long-term efficacy of botulinum toxin type A for the treatment of habitual dislocation of the temporomandibular joint

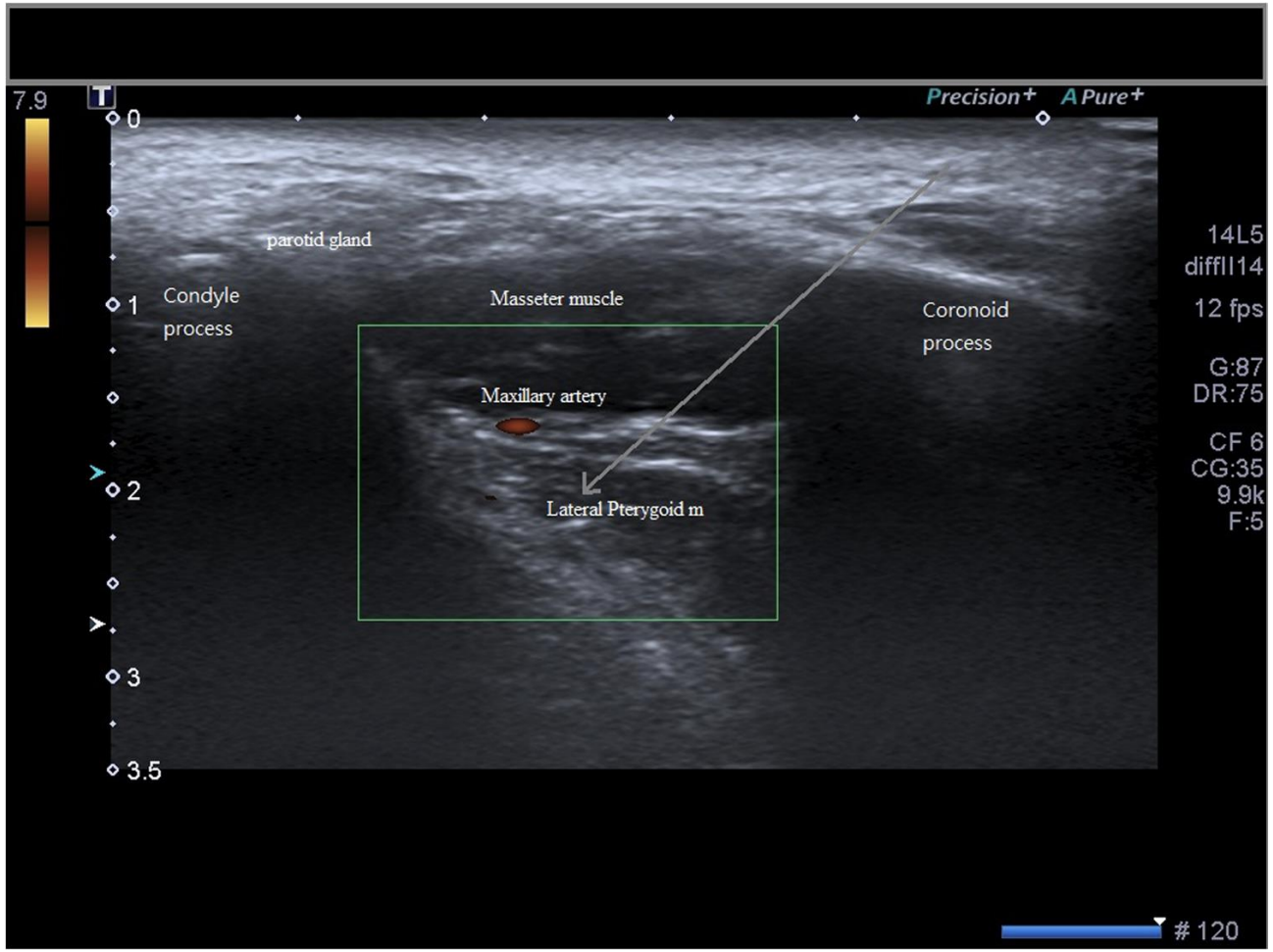
Kai-Yuan Fu[a,*], Hui-Min Chen[b], Zhi-Peng Sun[a], Zhen-Kang Zhang[c], Xu-Chen Ma[a]

- 5 patients.
- BTX-A inj given after reduction of dislocation by manual repositioning.
- Inj. into lateral pterygoid muscle. 20-25U.
- No recurrences.

Ferreira EF, Camões-Barbosa A. IncobotulinumtoxinA in refractory temporomandibular disorder due to disk dislocation: a prospective study. Journal of Stomatology, Oral and Maxillofacial Surgery. 2024 Sep 1;125(5):101804.:

Fu KY, Chen HM, Sun ZP, Zhang ZK, Ma XC. Long-term efficacy of botulinum toxin type A for the treatment of habitual dislocation of the temporomandibular joint. British Journal of Oral and Maxillofacial Surgery. 2010 Jun 1;48(4):281-4.:

* Injecting into lateral pterygoid



(Guo et al., 2023)

Lateral pterygoid muscle and surrounding tissue by ultrasound image.
The vessel enhanced in color Doppler imaging is the maxillary artery.
The arrow line illustrates the needle trajectory and needle positioning during ultrasound-guided BTX-A injection.

Guo HJ, Wu CC, Li TC. Ultrasound-guided lateral pterygoid muscle botulinum toxin: an injection for recurrent temporomandibular joint dislocation in a brain injury patient. Oral and Maxillofacial Surgery. 2023 Jun;27(2):365-71.

Bruxism

- Numerous RCT's & systematic reviews – **controversial results**.
- Reported effects: ↓ bruxism events, ↓ clenching force or MBF/ ↓ intensity of muscle contractions/↓ pain severity/ ↑ MMO Chen et al., 2023, Buzatu et al., 2024, Hosgor et al, 2020, Patel et al., 2019, De la Torre Canales et al., 2017
- Effect may last for 3-4 months. Transient nature of some tx effects with symptoms resurfacing – requiring ongoing mx. ? Cost-benefit in the long-term. Buzatu et al., 2024
- Some studies – mixed outcomes/ no improvement in ROM or max occl force/ pain reduction not significantly better than placebo/control. Saini et al., 2024, Thambar et al., 2020, Ågren et al., 2020

Chen Y, Tsai CH, Bae TH, Huang CY, Chen C, Kang YN, Chiu WK. Effectiveness of botulinum toxin injection on bruxism: a systematic review and meta-analysis of randomized controlled trials. Aesthetic plastic surgery. 2023 Apr;47(2):775-90.

Thambar S, Kulkarni S, Armstrong S, Nikolarakos D. Botulinum toxin in the management of temporomandibular disorders: a systematic review. British Journal of Oral and Maxillofacial Surgery. 2020 Jun 1;58(5):508-19.

Patel J, Cardoso JA, Mehta S. A systematic review of botulinum toxin in the management of patients with temporomandibular disorders and bruxism. British dental journal. 2019 May;226(9):667-72.

Buzatu R, Luca MM, Castiglione L, Sinescu C. Efficacy and safety of botulinum toxin in the management of temporomandibular symptoms associated with sleep bruxism: a systematic review. Dentistry Journal. 2024 May 23;12(6):156.

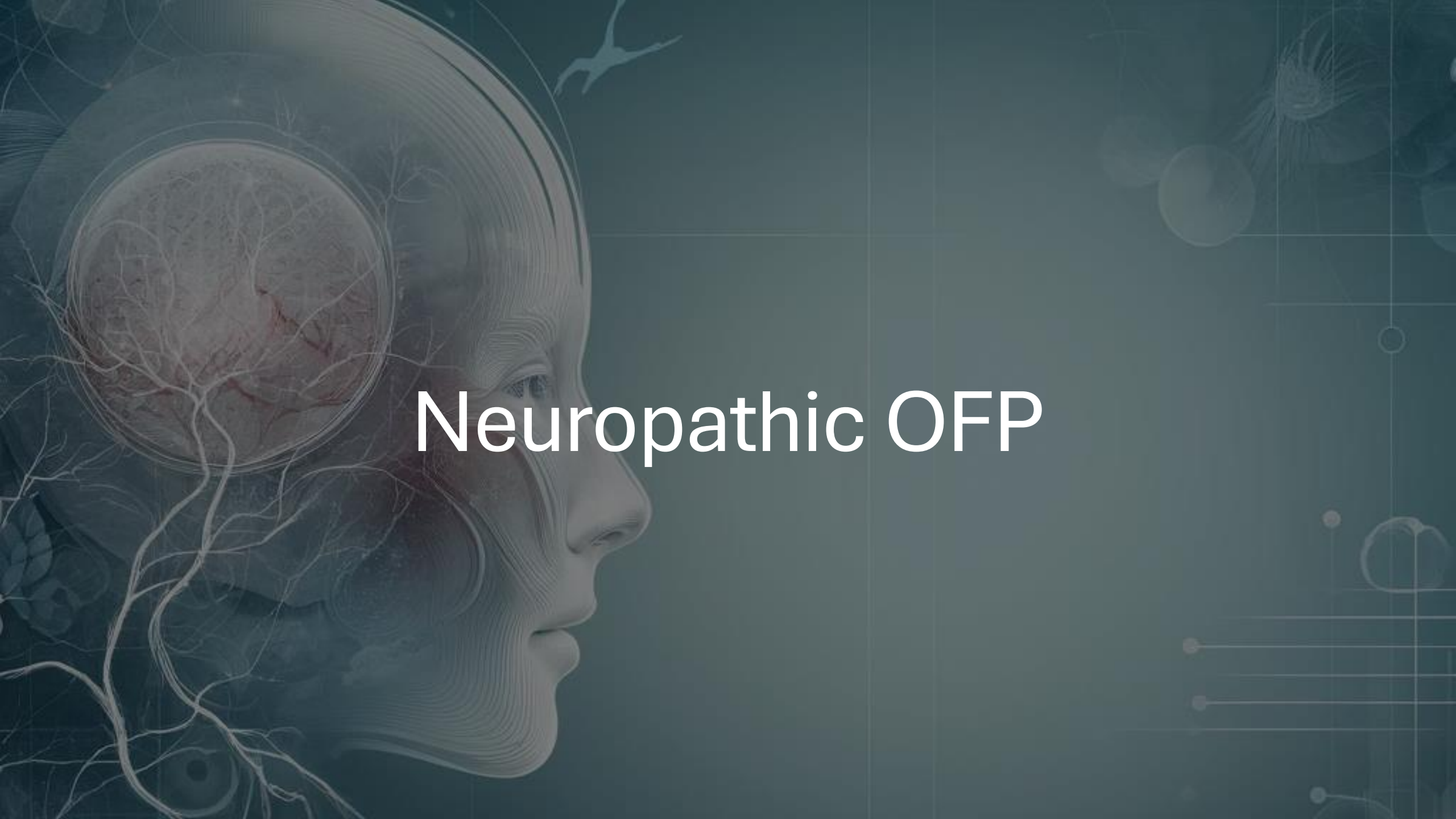
Journal of Oral & Facial Pain and Headache
MRE Press FREE FULL TEXT
2022

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

Robert Delcanho [1,2,3], Matteo Val [4,5,6], Luca Guarda Nardini [4,5,6], Daniele Manfredini [7,8,9,10]

- 24 RCTs.
- Categories identified:
    1. Myofascial pain (and/or myospasm)
    2. TMJ articular disorders
    3. Bruxism
    4. Masseter hypertrophy
- Wide variability in methods of injection & doses.
- Majority evaluated BTX type A.
- Most commonly injected: masseter + temporalis together (other: masseter alone/ lat.pterygoid alone)
- Most used palpation to establish injection sites. (other: EMG/US).
- Units injected & dose per individual muscle varied greatly.
- Not necessarily superior to currently available less invasive & less expensive conservative tx.
- **Key findings:**
    - Sufficient evidence for use in **masseter hypertrophy**.
    - Equivocal evidence for use in **masticatory myofascial pain.**
    - Re. **bruxism**: available research is inconclusive & does not show enough evidence for its use in tx.
    - Insufficient evidence for its effectiveness in **TMJ articular disorders.**
    - Need for further controlled studies.

Delcanho R, Val M, Nardini LG, Manfredini D. Botulinum toxin for treating temporomandibular disorders: what is the evidence?. Journal of oral & facial pain and headache. 2022 Jun 2;36(1):3023.



Neuropathic OFP

Trigeminal Neuralgia

- Efficacy of BTX A in treatment of classical TN: Jabbari B., 2022
  - Zhang et al, 2014, Wu et al, 2002 (randomized, double-blind, placebo-controlled trials)

Toxins. 2021

Effects of Botulinum Toxin Type A on Pain among Trigeminal Neuralgia, Myofascial Temporomandibular Disorders, and Oromandibular Dystonia

by **Kazuya Yoshida**

- 16 patients with third-division TN: Injected submucosally or subcutaneously into trigger zones.
- 12 patients with second-division TN: Injected into sphenopalatine ganglion.
- Average dose per injection: 43 U.
- Mean pain improvement: ~83% - 91%

4. Conclusions

Injection of botulinum toxin type A can be a highly effective and safe way to treat TN, myofascial TMD, and OMD.

Yoshida K. Effects of botulinum toxin type A on pain among trigeminal neuralgia, myofascial temporomandibular disorders, and oromandibular dystonia. Toxins. 2021 Aug 29;13(9):605.

Jabbari B. Botulinum Toxin Treatment of Chronic Facial Pain: Trigeminal Neuralgia and Temporo-Mandibular Disorders. InBotulinum Toxin Treatment of Pain Disorders 2022 Jun 3 (pp. 191-213). Cham: Springer International Publishing.

Toxins. 2023

Systematic Review

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] and Daniele Manfredini [1]

- 6 RCTs. **TN** (5) and **post-herpetic neuralgia** (1)
- Site selection: subjective pain perception & tactile allodynia.
- Amount injected, technique, site, & no. of injections varied.
  - Amount injected: 25U - 140U
  - No. of injection sites: 8 - 25
- All studies: anti-epileptics were maintained.

- All studies- ↓ pain intensity vs placebo & lidocaine.
- Most studies: ↑ QoL.

- **Not possible to identify a common or recommended protocol.**
- **Probably has a clinically significant benefit.**
- **Weak evidence to say further ↓ pain intensity when used as an adjunct anti-epileptic drugs.**

Val M, Delcanho R, Ferrari M, Guarda Nardini L, Manfredini D. Is Botulinum Toxin Effective in Treating Orofacial Neuropathic Pain Disorders? A Systematic Review. Toxins. 2023 Sep 1;15(9):541.

Other Orofacial Conditions: **PTTNP, PIDAP**

- Effect of BTX-A in PIDAP and PTTNP.
- No. of injection sessions ranged from 1-10.
- Dose and no. of sites also differed: **10-30U** & 3-12 sites.
- Pain reducing effect: **50-72%**

Journal of Oral Rehabilitation, 2020

The effect of botulinum toxin A on patients with persistent idiopathic dentoalveolar pain—A systematic review

Andreas Dawson[1,2,3] | Jenny Dawson[1] | Malin Ernberg[3,4]

Conclusions: This systematic review shows that presently the level of scientific evidence is insufficient to evaluate the pain-relieving effect of BONT-A injections in patients with PIDP. There are indications that BONT-A injections could be a possible management option for patients with PIDP that seems to be safe and with few adverse events. There is a need for well-designed placebo-controlled, double-blind RCTs.

J Oral Facial Pain Headache, 2024

Onabotulinum toxin a treatment for posttraumatic trigeminal neuropathic pain: case series and literature review

Huann Lan Tan [1,2], Pankaew Yakkaphan [1,3], Amandine Beke [1], Tara Renton [1,*]

- BTX-A on refractory PTTNP.
- 3 - 35 units of BTX-A inj. directly subcutaneously &/or submucosally into affected regions.
- Submucosal IO inj: buccal vestibule, gingiva & hard palate.

- BTX-A may be a **potential tx modality for refractory PTTNP.**
- Large scale RCTs required.

Dawson A, Dawson J, Ernberg M. The effect of botulinum toxin A on patients with persistent idiopathic dentoalveolar pain—A systematic review. Journal of Oral Rehabilitation. 2020 Sep;47(9):1184-91.

Tan HL, Yakkaphan P, Beke A, Renton T. Onabotulinum toxin a treatment for posttraumatic trigeminal neuropathic pain: case series and literature review. Journal of Oral & Facial Pain and Headache. 2024 Mar 12;38(1):93.

Other Orofacial Pain Conditions: **BMS**

= Burning mouth syndrome

- **No. of studies is scarce**. Only one placebo controlled clinical trial – Restivo et al., 2017. Etemad-Moghadam et al., 2022
- Dosage ranges from 50U – 100U.
- Injected into masticatory muscles, the tongue, and lip.
- Effects starting from 48 h to 3 wks later and lasting up to 20 wks.
- **A conclusion cannot be drawn on efficacy.**

Etemad-Moghadam et al., 2022

Authors	Patients	History	Symptoms	BoNT	Dose	Injection site	Outcome	Time to effect	Lasting effect
Seo et al. 2009 [118]	*N* = 1 Female 54 y	Neuroleptic therapy	Tongue dyskinesia + severe oral burning 5 y after therapy for neuroleptic therapy	BoNT-A	50U	Tongue muscles	Both issues improved	10 d	NS, injections given each month for 2 y
Restivo et al. 2017 [119]	*N* = 6 Females: 5[a] Male: 1 67–76 y	Diabetes in 3 patients	Anterior 2/3 of tongue + lower lip for at least 6 m	Inco-botulinumtoxinA	16U	Bilateral lower lip + bilateral anterolateral tongue	Initial 60–90 VAS reduced to 0	48h	12–20 w
Kwon and Park 2020 [120]	*N* = 1 Female 60 y	N/S	Burning + dryness	Meditoxin	100U	60U in both masseters + 40U in both temporalis	Initial 5 NRS reduced to 2	3 w	N/S

Etemad-Moghadam S, Alaeddini M, Jabbari B. Botulinum Toxin in Dentistry and Treatment of Chronic Orofacial Pain. InBotulinum Toxin Treatment of Pain Disorders 2022 Jun 3 (pp. 311-357). Cham: Springer International Publishing.

Headache Disorders

Migraine

- **PREEMPT I** and **PREEMPT II** (Phase III Research Evaluating Migraine Prophylaxis Therapy) studies – 2010.
  - 1384 patients.
  - Min. intramuscular dose of 155U on ONA-BoNTA (max 195U)
  - 31 injection sites across 7 H&N muscles.
  - Main results estb. ONA-BoNTA is **safe, well tolerated & effective** in prophylactic tx of **chronic migraine**.

Kępczyńska & Domitrz 2022, Aurora et al., 2010, Diener et al., 2010

Kępczyńska & Domitrz 2022

Area of Injection	Recommended Dose
Frontalis	20 units (4 sites)
Corrugator	10 units (2 sites)
Procerus	5 units (1 site)
Occipitalis	30 units (6 sites) + 10 units in 2 sites (follow the pain areas—optional injections)
Temporalis	40 units (8 sites) + 10 units in 2 sites (follow the pain areas—optional injections)
Trapezius	30 units (6 sites) + 20 units in 4 sites (follow the pain areas—optional injections)
Cervical paraspinal muscle group	20 units (4 sites)
	Summary: 155–195 units

OnabotulinumtoxinA dosing in chronic migraine according to protocol PRREMPT

Kępczyńska K, Domitrz I. Botulinum toxin—a current place in the treatment of chronic migraine and other primary headaches. Toxins. 2022 Sep 5;14(9):619.

Aurora SK, Dodick DW, Turkel CC, DeGryse RE, Silberstein SD, Lipton RB, Diener HC, Brin MF. OnabotulinumtoxinA for treatment of chronic migraine: results from the double-blind, randomized, placebo-controlled phase of the PREEMPT 1 trial. Cephalalgia. 2010 Jul;30(7):793-803.

Diener HC, Dodick DW, Aurora SK, Turkel CC, DeGryse RE, Lipton RB, Silberstein SD, Brin MF. OnabotulinumtoxinA for treatment of chronic migraine: results from the double-blind, randomized, placebo-controlled phase of the PREEMPT 2 trial. Cephalalgia. 2010 Jul;30(7):804-14.

Summary- BoNT-A use in orofacial pain conditions

Orofacial Pain Type	Efficacy Summary	Clinical Notes	Injection Sites
Trigeminal Neuralgia (TN)	BoNT-A is a viable addition to the treatment options of patients with TN. There is a need to establish proper dosing	Considered when standard treatments (e.g., carbamazepine) fail or are not tolerated; the advantage of a one-time injection is obvious	Trigger areas (e.g., gums). Intradermal or submucosal along painful trigeminal branches; avoid deep muscular injection
Post-Traumatic Trigeminal Neuropathy (PTTN)	Limited evidence; data is based on small trials and case reports, or preclinical experiments	Some patients benefit, but animal experiments demonstrated the central antinociceptive effect of BoNT-A on peripheral neuropathic pain	Near affected peripheral nerve (e.g., mental foramen region); avoid causing motor dysfunction
Myofascial Orofacial Pain (TMD/MOP)	Conflicting data with moderate to low certainty. However, long-term efficacy cannot be ignored	Some benefit in refractory cases; similar effect to anesthetics; not superior to placebo in many trials	Masseter, temporalis, medial pterygoid, and neck muscles based on trigger point's location
Facial Migraine (Chronic Neurovascular Orofacial Pain)	A key prophylactic therapy for chronic migraine, but a lack of studies in facial migraine	Approved for chronic migraine; limited data in facial variants but rationale supported by trigeminovascular mechanisms	Forehead, scalp, or subdermal facial areas avoiding mimic muscles to prevent asymmetry

Sharav Y, Benoliel R, Haviv Y. Botulinum Toxin-A, Generating a Hypothesis for Orofacial Pain Therapy. Toxins. 2025 Aug 4;17(8):389.

- Further well-designed placebo-controlled, double-blind RCTs are required.
- Dosing protocols to be established.

Adverse effects

- Large margin of safety.
- Usually mild .
- Tend to occur 1–2 weeks after injection and are usually transient. Scheinberg 2009

- Localised pain/ tenderness. Fu et al., 2010, Scheinberg 2009
- Bruising/ haemorrhage. Fu et al., 2010, Scheinberg 2009
- Hyperesthesia. Fu et al., 2010, Scheinberg 2009
- Local weakness/ transient facial weakness/ asymmetry. Scheinberg 2009
- Headache and flu-like symptoms. Chen et al 2015

Scheinberg A. Clinical use of botulinum toxin. Aust Prescr 2009;32:39-42

Fu KY, Chen HM, Sun ZP, Zhang ZK, Ma XC. Long-term efficacy of botulinum toxin type A for the treatment of habitual dislocation of the temporomandibular joint. British Journal of Oral and Maxillofacial Surgery. 2010 Jun 1;48(4):281-4.

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Complications

- Dysphagia, nasal speech, painful chewing, nasal regurgitation, and dysarthria. [subside within 2–4 weeks]. Fu et al., 2010.
- Rare: skin rash, pruritus and allergic reaction. Scheinberg 2009
- Possible detrimental effects on mandibular bone in preclinical animals & humans. Correlation of bone loss with dosage & frequency of administration remains unknown. Moussa et al., 2024
- In rabbit models: With BTX paralysis of the masseter, the resulting underloading was sufficient to cause notable and persistent bone loss at the TMJ. Rafferty et al., 2012
- Overdose: symptoms of botulism, including ptosis, diplopia, deterioration in swallowing and speech, generalised weakness and respiratory failure. Scheinberg 2009
- Neutralising antibodies to BTX-can lead to loss of treatment effect. Okeson 2019.
  - Higher doses and shorter interval (< 3months). Jabbari B., 2022, Rahman et al., 2022, ebs.tga.gov.au
  - Longer duration receiving BTX-A (>10yrs) Rahman et al., 2022

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Contraindications

- Hypersensitivity to the active substance or any of the ingredients. (ebs.tga.gov.au, Scheinberg 2009)
- Infection or inflammation at the proposed injection sites. (ebs.tga.gov.au, Scheinberg 2009)
- Generalised disorder of muscle activity (eg. myasthenia gravis, Lambert-Eaton Syndrome). (ebs.tga.gov.au, Scheinberg 2009)
- Pregnancy/ breastfeeding. (Scheinberg 2009)
- Theoretical drug interactions - may interact with medications that affect neuromuscular transmission including aminoglycosides or curare-like compounds. (Scheinberg 2009)
- Toxin preparations contain albumin, which carries a theoretical risk for transmission of viral or prion diseases. (Scheinberg 2009)

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Thank You

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