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Growth effects of botulinum toxin type A injected unilaterally into the masseter muscle of developing rats

Key words: Botulinum toxin, Craniofacial growth, Mandible

Background

- Use of botulinum toxin type A (BTX-A) in the orofacial region has emerged in the field of dentistry.
- This study aimed to investigate the effects of BTX-A beyond the treatment options currently used and focused on the effects of reducing volume and altering the function of muscle hypertrophy and skeletal development, based on the functional matrix theory of Moss and Rankow.
- Previous studies of rat mandibles injected with BTX-A in bilateral masseter muscles, mandibular dimension were reduced compared to those of saline-injected rats, but these studies had a limitation of comparing effects between different individuals.

Aim

To evaluate the effects of unilateral injection of botulinum toxin type A (BTX-A) on mandible skeletal development by inducing hypofunction of masseter muscle in growing rats.

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Subject

60, 4-week old male Sprague-Dawley rats

BTX-A

Botox ® (Allegan, USA)

Design

Group 1 : Control group

0.05㎖ of saline on both side

Group 2 : Unilateral BTX-A injection group

Group 2-1(Control side) - 0.05㎖ of saline

Group 2-2(BTX-A side) - 3U(0.05㎖) of Botox ®

Group 3 : Bilateral BTX-A injection group

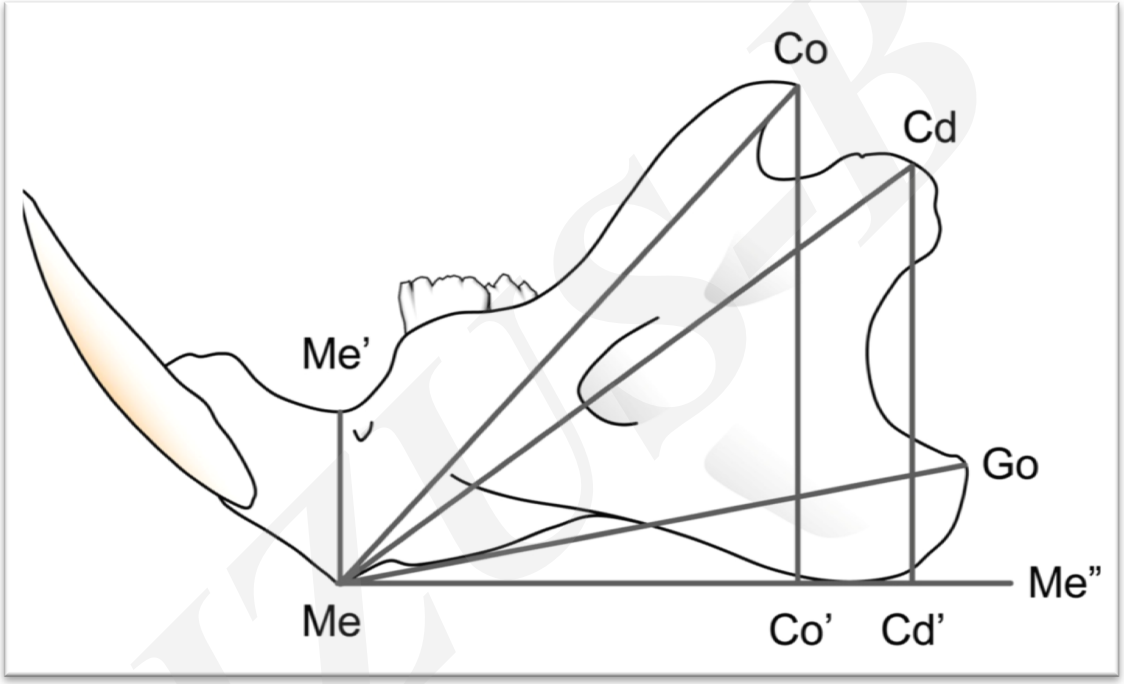
3U(0.05㎖) of Botox ® on both side

All animals were kept for 4 weeks(T_0 ~T_4) in rooms and fed standard and ground rat pellets and water ad libitum.

All subjects were weighed weekly & were sacrificed at 8-weeks of age(T_4)

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Mandibular measurements



Landmarks and measurements of mandible(adopted from Asano's study, 1986)

Me-Go: Mandibular body length **Me-Cd: Condylar length**

Me-Co: Coronoid process length **Me-Me': Anterior region height**

Co-Co': Coronoid process height **Cd-Cd': Condylar height**

Results

Significant difference between mandibular measurements of each group

Group	Mn body Length	Condylar length	Coronoid pr length	Ant region height	Condylar height	Coronoid pr height
1 vs 2-1	NS	NS	NS	NS	*	NS
1 vs 2-2	*	NS	*	*	*	*
1 vs 3	*	NS	NS	*	*	*
2-1 vs 2-2	*	*	*	*	*	*
2-1 vs 3	NS	*	NS	*	*	*
2-2 vs 3	NS	NS	NS	NS	NS	NS

Group 1 ; Control group
Group 2-1 ; Control side of Unilateral BTX-A injection group
Group 2-2 ; BTX-A side of Unilateral BTX-A injection group
Group 3 ; Bilateral BTX-A injection group
* Indicate a significant difference ($P < 0.05$)

Conclusions

Unilateral injection of BTX-A was associated with reduced mandibular growth.

Localized BTX-A injection may induce craniofacial growth changes.

Although both sides of the mandible function as one unit, the skeletal effects might be unilateral.

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