

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

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Accepted 16 July 2009

Available online 7 August 2009

Abstract

Injection of botulinum toxin type A (BTX-A) into the lateral pterygoid muscles is a recently reported treatment for habitual dislocation of the temporomandibular joint (TMJ). We report five cases of dislocation in elderly patients with neurological or other severe systemic disease, and their successful treatment with one injection of BTX-A into the lateral pterygoid muscles. This is a relatively conservative option. Injection into the muscle is straightforward and can be done in outpatients with few complications. We recommend it as the first choice for patients with habitual dislocation and systemic or neurological diseases, particularly in the elderly.

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Keywords: Temporomandibular joint; Dislocation; Botulinum toxin type A; Lateral pterygoid muscle

Introduction

Dislocation of the temporomandibular joint (TMJ) is defined as an excessive forward movement of the condyle beyond the articular eminence with complete separation of the articular surfaces and fixation in that position.¹ It is usually classified as acute, recurrent, or habitual. Acute is common and may be post-traumatic, spontaneous, or associated with psychiatric illness. When it becomes more frequent and progressively worse it is described as habitual or recurrent,² which is a rare condition. We report five elderly patients with habitual dislocation of the TMJ as a complication of neurological or severe systemic disease, who were treated successfully with one injection of botulinum toxin type A (BTX-A) into the lateral pterygoid muscles.

Patients and methods

Five patients with habitual dislocation of the TMJ were included in our study (Table 1). All had systemic diseases and other serious conditions, and came to our clinic in wheelchairs.

To measure the position of the lateral pterygoid muscles we did contiguous 1.25 mm computed tomograms (CTs) processed using a BrightSpeed Edge machine (GE Healthcare, Buckinghamshire, UK) and selected for measurement of an axial section under the zygomatic arch 1.25 mm thick that showed the coronoid process and the condyle (Fig. 1). We marked two lines from the skin surface to the centre of the muscle perpendicular to the skin surface, one behind the coronoid process and the other in front of the condyle. The two measurements represent the depth of the needle tips, one in the anterior, and the other in the posterior part of the lateral pterygoid muscle (Fig. 1).

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Table 1
Details of patients treated with injection of botulinum toxin A (BTX-A).

Case No.	Age (years)	Sex (M/F)	Pre-existing systemic disease	Dislocation		BTX-A dose/ muscle (units)	Duration of follow-up
				Frequency	Duration		
1	75	F	Compression fracture of the spine	10 times a day	1 week	50 left	2 years
2	55	M	Cerebral hemiplegia	6–8 times a month	1 year	25 left, 25 right	2 years
3	75	F	Osteoporosis, femoral neck fracture	Once a week	2 months	25 left, 50 right	1 year
4	81	M	Chronic pulmonary heart disease	3 times a day	1 day	25 left, 25 right	3 months ^a
5	72	F	Cerebral atrophy, chronic nephropathy	2–3 times a day	2 days	50 left, 50 right	3 months ^a

^a Patient died.

The BTX-A (Lanzhou Institute of Biological Products, China) was stored at -20°C and reconstituted with 0.9% saline. Solutions of 5 units/0.1 ml were drawn into a 1 cc tuberculin syringe with a 30-gauge needle. Two extraoral injections were given into the space formed by the zygomatic arch and the sigmoid notch of the mandible (Fig. 2), the first 1 cm below the central zygomatic arch (Fig. 3), and the second 0.5–1 cm posterior to the first site just in front of the condyle of the mandible. The needle was advanced at right angles to the skin with mouth closed; the lateral pterygoid muscle was found at a depth of 3–4 cm, the exact depth having been worked out from measurements done on CT. The syringe was aspirated to ensure that the tip was not inside a blood vessel before the appropriate amount of BTX-A was injected into the muscle.

Results

Four patients were diagnosed with bilateral habitual dislocations and one with unilateral dislocation. Injections of BTX-A 25–50 units/muscle at the two sites were given after

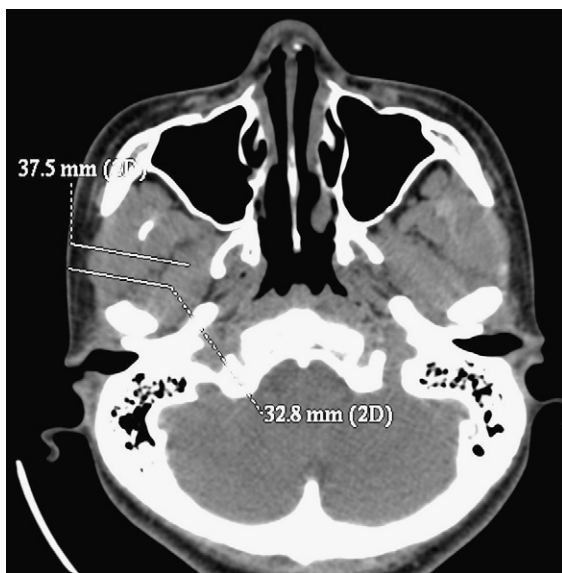


Fig. 1. Axial computed tomogram under the zygomatic arch showing measurement of the position of the lateral pterygoid muscle. The two lines show the depth of the needles and the path of the injections.

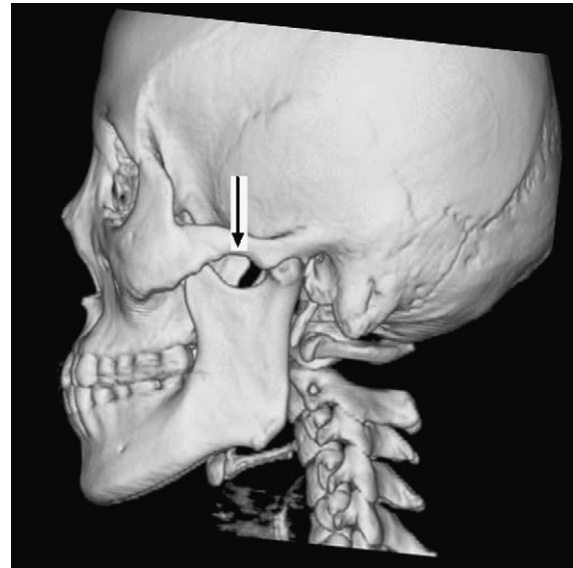


Fig. 2. Three-dimensional computed tomogram showing the space (arrow) formed by the zygomatic arch and the sigmoid notch of the mandible.

reduction of the dislocation by manual repositioning of the condyle. One patient only reported one dislocation on the second day after injection. All treatment was successful, and there were no recurrences and no need for further injection during follow-up of 3 months to 2 years.



Fig. 3. Photograph of injection of botulinum toxin type A about 1 cm below the central zygomatic arch.

BTX-A injection does not seem to have an immediate effect; mandibular fixation with elastic bands was required for 4–5 days. There were no immediate or delayed side effects.

Discussion

Previous reports have highlighted the predisposing and aetiological factors for dislocation of the TMJ,³ which include congenital joint weakness, extreme mouth opening during yawning, trauma, and dental and otorhinolaryngological treatments. We know of few reported cases of recurrent dislocation as a complication of general anaesthesia, or as a side effect of some medications used in psychiatric or psychological chemotherapy, and few reported cases in patients with neurological disease (called neurogenic dislocation of the TMJ) such as in those with multiple sclerosis or Parkinson's disease, or after a stroke.^{4–7} All our patients had severe systemic diseases (Table 1), and three had neurological diseases such as cerebral hemiplegia, cerebral atrophy, and compression fracture of the spine. Dislocation in these patients occurred spontaneously and repeatedly during normal daily activity with no specific cause, and the term “habitual” dislocation has been recommended to describe it. Its cause may be different from that in young or healthy people, and although we did not know the mechanism of dislocation, we assumed that the cause was an imbalance of muscular activity between opening and closing of the jaws because of neuromuscular dysfunction.

Many treatments for recurrent dislocation are available including operation, but this may not be indicated for elderly patients in poor health; conservative treatment should be the first choice. Immobilisation of the mandible by maxillo-mandibular fixation and active physiotherapy have been used alone or with other treatments, but have failed to achieve permanent, satisfactory results.⁸ It is also difficult for such patients to comply with the treatment. Injection of a sclerosing agent into the cavity of the TMJ has been used with the therapeutic intent to cause fibrosis with resultant tightening of the capsule, but it has not been recommended because sclerosing agents generally have an unacceptably low rate of success, and cause some side effects.^{9,10} We introduced the use of BTX-A injection as it is a more recently reported treatment to alter the musculature with the intended effect to weaken the lateral pterygoid muscles sufficiently to prevent dislocation. This caused a new imbalance between the muscles used for opening and closing the jaws, and mouth opening was slightly limited because of the weakness of the lateral pterygoid muscles.

BTX-A produces dose-related weakness of skeletal muscle by impairing the release of acetylcholine at the neuromuscular junction, and it has been much used as a treatment of choice for focal dystonias and other conditions with involuntary muscle activity, and recently for treating recurrent dislocation.^{4,11–13} Repeated muscle injection after 3–6 months is often required to treat dystonias of the

muscle because recovery occurs through proximal axonal sprouting and muscular reinnervation by the formation of a new neuromuscular junction.¹⁴ However, for dislocation of the TMJ, injection of BTX-A has been reported to have a good outcome, and in some patients one injection may be sufficient.^{4,11,15} We gave one injection and no further dislocations occurred during follow-up of 3 months to 2 years. The result further supports our assumption that the dislocation was caused by an imbalance of muscular activity on mouth opening and closing, and not by excessive muscular activity.

A potential side effect of any injection is haemorrhage. The lateral pterygoid muscle lies close to the maxillary artery and the pterygoid venous plexus. We recommend that injection be stopped if blood is aspirated before injection of BTX-A. Other side effects caused by diffusion of the drug into adjacent muscles include transient dysphagia, nasal speech, painful chewing, nasal regurgitation, and dysarthria, all of which subside within 2–4 weeks.^{11,12}

BTX-A injection is invasive, but is a relatively conservative option because it is a safe and effective treatment for dystonia. It can be used as an initial approach because injection into the lateral pterygoid muscle is straightforward and can be done in outpatients with few complications.¹²

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