

A Clinical Observation of the Treatment of the Muscule Spasms Following the Cerebral Hemorrhage with Botulinum Toxin A

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Abstract

Objective: To investigate the therapeutic effects of the Botulinum toxin type A (LANTOX) on the muscular spasms following the cerebral hemorrhage.

Method: The location point injection of LANTOX in fixed doses and at regular time into the involved muscle, or muscle group was applied to observe the alternations of the muscular spasms pre-therapy and post-therapy, the improvement in the motion functions after the therapy and the changes brought by the correction of the joint malformation.

Result: An assessment was carried out according to Koman's Physician Rating Scale (PRS). It was found that there was a remarkable remission of the muscular spasms following the cerebral hemorrhage with LANTOX is not only reliable but also effective, making the involved muscle or muscle group relaxed, correcting the joint malformation and restoring the motion function to the different degrees.

Key words: Botulinum toxin type A; Muscular spasm; Location point

The treatment of muscular spasms after Cerebral hemorrhage (CH) is always one of the biggest difficulties that puzzled the physician in neurology. Since March 1997, Botulinum toxin type A is used to treat the muscle spasm after CH in 11 cases; it was associated with the rehabilitation therapy and physiotherapy, the curative effect is satisfactory. The report is as follows.

Information and Method

1. General Information

The 11 patients were from out-patient of the neurology department from March 1997 to November 2001, they matched the requirement of the standard of diagnosis in the Book of Neurology (2nd edition). They all have hypertension in their medical history; it was the first time to have hemorrhage, after the inspection of the nervous system, the chance of non-hypertension induced cerebral hemorrhage was excluded. The 11 patients undergo a serious of inspection to ensure the CH was caused by hypertension including CT, Electromyogram (EMG), bilateral podosoma elbow, wrist, hip and knee, ankle joint, X-ray, 3 cases under MRI inspection, confirmed diagnosed as hypertension induced CH. The treatment of emergency case is according routine

practice and rescues the patient's life. After the condition become stable, they will have hospitalization and under observation. After the life indicator become stable, in the case of muscular tension of the bilateral podosoma paralysis increases, before confirmation of undergoing the rehabilitation therapy, a specialist will select the point for injection of Botulinum toxin type A. Ten days for one injection, 3-4 times in total. To all cases, rehabilitation therapy and physiotherapy will begin after 10 days of the first injection and it lasted for 3 months. The patients have to visit the hospital and have telephone visit after 6 months, 1 year, 3 years, 4 cases have to undergo tracking photography and image recording.

In this study, 7 male and 4 female; they were aged 54~74, the pathogenesis was from 6 hours to 3 years, 7 months on average; 5 cases of left-sided spastic hemiplegia, right sided 6 cases; elbow joint flexion and adduction 11 cases, combined wrist flexion 3 cases, hand flexion 7 case, knee ankylosis 8 cases, foot drop 5 cases, in 11cases, the side of paralysis have different myoatrophy intensity; 8 out of 11 case had taking medicine discontinuously. Acupuncture and moxibustion, physiotherapy can relief the symptoms temporary, but later, because of the side effect of the medicine and the unsatisfactory efficacy, the treatment was stopped.

2. Method

Drug Therapy:

1) Drug: Lyophilized crystalline of Botulinum toxin type A, developed by Lanzhou Institute of biological products in the hygiene department, there are 2 specification, 55U and 100U per vial, stored in refrigerator, diluted with saline slowly when use. Dilution concentration is 2.5U in 0.10 ml. Different dosage and point of injection were selected according to different clinical condition in each case. Commonly used dosage is 100~200U per time. 3~4 treatment per case and 10 days part, the injection dosage of each injection point is 2.5~5U. For case that the condition is much more serious, the relaxation of muscle spasm is not ideal; the treatment can be repeated once after a month.

2) Point selection: according to the intensity, location of dyskinesia, part of rehabilitate training, size and the area of affected muscle and site of dissection of muscle spam after CH in patient, point of injection on major muscle or antagonistic muscle. The distance is 2 cm between the points of injection. Electromyogram is used in all cases for allocation, to find out the site and the intensity of the depth of the muscle (muscle group) spasm. Using gentian violet to fix the point, and use the iodine tincture to fix the point to avoid deviation of injection that affects the efficacy. The

injection should be accurate, direct into the muscle belly and with appropriate depth. In 11 patients, 7 had 4 injections and 4 had 3 injections. 3 among 11 cases had the re-treatment. 10 days after the first injection, rehabilitation therapy and physiotherapy started, the duration is 3 months in total. According to the clinical condition of 11 patients and the correction of the malformed site, the selection of affected muscle (muscle group) was shown in table 1, the injection dosage and no. of point of injection was shown in table 2.

Rehabilitation Therapy and Physiotherapy: In 11 patients, rehabilitation therapy and physiotherapy began after 10 days of the first injection and it lasted for 3 month. Before the treatment, rehabilitation physician referred to Koman's Physician Rating Scale (PRS) ^[1] and combined the characteristics of cases in the treatment group to have the assessment, to set up a planning of rehabilitation therapy. To guide the patient to have the rehabilitation therapy and gradually increase their activity from the bed to standing up. A variety of instruments for upper and lower limb activity can be selected, bicycle, treadmill, rowboat, weightlifting, running, squat activity, etc, 5 patients selected purpose-made orthopedic equipment for hand, associated with exercises, correct the flexion malformation of hands. Short wave and ultra-short wave treatment were used in physiotherapy, associated with acupuncture and moxibustion, massage to increase the blood flow, improve the blood circulation and recover the activity function.

Efficacy Evaluation: 11 patients were evaluated according to Koman's Physician Rating Scale (PRS) and combined the characteristics of cases in the treatment group, the identification standard are that the elbow, wrist and hand flexion malformation remains unchanged scored 0, passive ambulatory malformation scored 1, malformation occasionally normotopia scored 2, free movement scored 3, knee ankylosis, flexion recovery $<30^\circ$ scored 0, flexion recovered $>45^\circ$ scored 1, flexion recovery $>60^\circ$ scored 2, flexion recovery $\geq 90^\circ$ scored 3; foot drop and malformation remains unchanged scored 0, passive ambulatory malformation scored 1, heel occasionally touchdown scored 2, heel normally touchdown scored 3 ^[2], the assessment before and after the therapy was shown table 3.

Table 1 Selected muscle(s) in patient with muscle spasm after CH

Type	Cases	Selected muscle(s) in the affected area
Elbow joint flexion and adduction	11	Biceps muscle of arms
		brachial muscle
		brachioradial muscle
Wrist flexion	3	Radial flexor muscle of wrist
		ulnar flexor muscle of wrist
		brachioradial muscle
Hand flexion	7	Superficial and deep flexor muscle of fingers
		Short and long flexor muscles of thumb
		Short flexor muscles of little finger
Knee ankylosis	8	quadriceps muscle of thigh
		tensor muscle of fascia lata
		Sartorius muscle
Foot drop	5	Gastrocnemius muscle
		soleus muscle
		posterior tibial muscle

Table 2 Dosage and no. of point(s) per injection per muscle(s)

Name of Muscle(s)	Dosage (U)	No. of point(s)
Biceps muscle of arms	25~50	16
Brachial muscle	10~20	5
Brachioradial muscle	10~30	6
Radial flexor muscle of wrist	15~30	5
Ulnar flexor muscle of wrist	15~30	5
Superficial flexor muscle of fingers	10~20	4
Deep flexor muscle of fingers	10~20	4
Long flexor muscles of thumb	10~20	4
Short flexor muscles of thumb	10~15	3
Short flexor muscles of little finger	10~15	3
Quadriceps muscle of thigh	50~75	20
Tensor muscle of fascia lata	10~20	6
Sartorius muscle	10~20	6
Gastrocnemius muscle	30~60	18
Soleus muscle	20~30	8
Posterior tibial muscle	20~30	8

Table 3 PRS score before and after the LANTOX treatment of muscle spasm after CH

Case	Elbow joint flexion and adduction		Wrist flexion		Hand flexion		Knee ankylosis		Foot drop	
	B	A	B	A	B	A	B	A	B	A
1	0	3			0	3	0	3	0	3
2	0	3	0	3	0	3				
3	0	3	0	3	0	3	1	3	0	2
4	1	3					0	2	0	3
5	0	3					0	3	0	2
6	1	3								
7	0	3			0	2	1	3	0	2
8	1	2	1	2	1	2				
9	1	2			1	2	0	2		
10	1	2			1	2	0	2		
11	1	2					0	2		

B: Before A: After

Result

All 11 cases reported effective and the efficacy reached 100%. After the statistical management, there was a significant difference between before and after the treatment. ($t=3.86$, $p=0.01$). There was 11 cases have elbow joint flexion and adduction malformation, 7 cases were totally corrected, 4 cases partly corrected; there was 8 cases have lower limb knee ankylosis, 4 cases totally corrected, 4 cases partly corrected. There was 5 cases have foot drop, 2 cases totally corrected, 3 cases partly corrected; after having rehabilitation therapy and physiotherapy for 3 months, the dyskinesia in 11 patients got a different level of improvement; in 11 cases, 7 cases can take care by themselves fully, 6 cases can walk smoothly., the gait improved.

In 7 cases that had hand flexion, there were 4 cases that some of the fingers cannot stretch completely after 10 days of having the treatment, the most commonly found are in the middle finger and little finger. Special treatment is not required. The symptoms disappeared after stopping the treatment for a month. Within 11 patients, although they felt slightly painful locally after the injection, there were no special uncomfortable and any other side-effects.

11 patients were being visited for 6 months, 1 year, 3 year, clinical condition were

remain unchanged, no recurrence of the muscle spasm, the mobility were future improved in 3 patients, the ability if self-caring were increased.

Discussion

Muscle spasm after CH normally occurred within several days or weeks after CH. The paralyzed limb changes from flaccid to spasmodic, hypermyotonia, upper limb appeared flexion and adduction, lower limb knee ankylosis, foot drop scuffle gait, always expresses as reflex tendon hyperfunction, ankle-clonus, etc, they are as upper motor neurogenic hemi paralysis. Rehabilitation therapy of the hemi paralysis is always a topic of clinical research.

In the past, the treatment of muscle spasm after CH was quite prickly, although the medical treatment did show some effectiveness, the side effects are great, the medication cannot be stopped, and patients feel difficult to persist. The effectiveness of other treatment methods are instable, they cannot used as a first choice therapy. Especially is the training plan of the rehabilitation physician, because it is difficult for patients with myospasms to have movement, even when they face a variety of equipments used for correction of malformation, they cannot use them normally.

As LANTOX is used in treating myodystonia disease clinically, especially is the precise and reliable efficacy in treating local muscle spasm, have been recognized by many clinical workers^[3]. Botulinum toxin type A is an exotoxin with high toxicity that produced the *Clostridium botulinum* in their growth and reproductive process, normally exists as a complex format of neurotoxin and hemagglutinin; it is used near the motor nerve ending junction, inhibits the release of acetylcholine from the pre-synaptic membrane and induced the flaccid paralysis of muscle^[4]. After the electrophysiological research validation by the foreign scholars, Botulinum toxin type A has double effect on afferent fibers and efferent motoneuron^[5]. In certain condition, the pharmacological action can make the spasm muscle flaccid and elongate so as to lead the flexion malformed joint to recover to the original. Heel lowering touchdown, stiffed joint become flaccid and return to its original position^[3]. In the condition that the muscle is flaccid, rehabilitation therapy and physiotherapy can have a target effect on function training and makes the physiotherapy effective. Therefore, different exerciser can be choose, guide the patient to repeat the exercises according to the guidelines so as to secure the effect of LANTOX and some cases can achieve a permanent curative result^[6].

4 out of 11 patients (pathogenesis over 1 year, the longest one was 3 years),

osteoarticular film indicated that the gap between the joint narrowed, long bone and the head of femur became a bit smaller in the joint in the affected side. The recovered activity may not as ideal as expected, this may related to the pathogenesis and the skeleton deformation. Skeleton deformation can increase the difficulties in activity function recovery, or even have an irreversible unchangeable relationship. The reason of the bad correction of the flexion malformation part of the wrist and hand is related to the muscle that control activity is small, the overlap and reciprocate of the anatomic site. The smaller and the deeper of the muscle, the more difficult to handle the dosage and the depth of injection, and so, the efficacy is worse than injecting into thick and big muscles. Further improvement of the treatment method has to be waited in order to increase the efficacy.

Using LANTOX as a treatment of muscle spasm after CH is safe, effective and new method. Especially to make the spasm muscle flaccid as soon as possible before the rehabilitation therapy, create favorable conditions for rehabilitation therapy, at the same time, it would provide a good chance to build the body. The purpose of the rehabilitation therapy after CH is to improve and recover the activity function of patients, decrease the rate of disability, let the patient to go back to the society and to achieve lowering the economic burden of society and the family.

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