

# **Application of Integrated Treatment of LANTOX and Rehabilitation to Cure Limb Spasm after Stroke**

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One of the most common sequela of stroke is the tension increase of paralytic muscle or spasm, which leads to bending of upper limb joints as well as rigidity in joints of lower limbs, or even deformity that brings mal-function to limbs. We tried to inject botulinum toxin type A into bicep brachii to cure 8 cases of rigid bending and deformity in elbow joint. We successfully reduce the tension of flexor in upper limbs, increase the muscular strength in elbow extensor, as well as broaden the scope of the voluntary movement of elbow joint.

## **1. Information and Procedures**

**Information:** We cured 8 cases of bending spasm or deformity in elbow joint after stroke from May 1996 to April 1997. 6 cases out of 8 were men while the other 2 cases were women. Their ages were in between 45 to 75, with an average 61. 4 cases showed cerebral infarct; 2 cases showed cerebral hemorrhage; the other 2 suffered both. They had suffered for 2 to 4 years, with an average 2.8 years. All cases demonstrated conscious mind with normal verbal presentation ability, infected limbs showed grasping power with at least category III, and they did not suffer from mal-function of intestine nor serious blood deficiency of cardiac muscle. Naming the site of dissection of elbow joint as the standard ( $0^\circ$  when the elbow joint is fully stretched), the bending deformity of elbow joint was greater than  $120^\circ$ . All patients could not take care themselves due to serious arm spasm. The drug used for treatment was lyophilized crystal from botulinum toxin type A which was made in China. Each vial contained 100 units (each unit corresponds to  $LD_{50}$  [mice], or 0.04ng toxin). The drug should be stored at  $-5$  to  $-20^\circ\text{C}$ .

**Procedure:** All patients were either sat down or lied down. For those who were sitting, their affected elbow joints and forearms were put on a table in front of the chest with a height reaching the heart; for those who were lying down, their affected elbow joints and forearms were put aside the bodies, and the infected limbs were fixed by assistant. Adrenalin of 1:1000 and oxygen were well prepared in case there was allergy. The drug was diluted with saline to 50 unites per mg. Afterwards, 4 to 6 site injection treatment were carried out on the bicep brachii with high tension. Each

site was injected with 15 units. It should be noticed that the drug should not be injected into the blood vessels. Patients could leave the therapy room only if they did not show fainting or allergy in 30 minutes. When the tension of the bicep brachii was reduced 2 days after treatment, functional training was carried out by rehabilitation therapists. The training mainly included passive dragging, motion of elbow extensor, rotation of arm, strutting action of the forearm etc. Re-injection was needed if unsatisfactory improvement on rigid bending of elbow joint or no apparent reduction of bicep brachii tension after 1 week, with slightly reduced dosage. Collaboration of rehabilitation therapists and the drug treatment lasted for 2 weeks or more. After the introduction of botulinum toxin type A within 2 weeks, did not take other drugs which affect the muscular tension. Avoid using streptomycin, sentamycin and quinine. Observation guidelines: movement observation of the appearance and tension of bicep brachii, muscular strength of elbow extensor, rigid bending or deformity angle of elbow joint, variation of joint movement of elbow joint, as well as whole body response.

### **Result**

All cases showed no whole body response after LANTOX treatment, there were no local reddening, swelling, heating and pain. 2 days later, the appearance of bicep brachii became smaller, that meant the bulge reduced. Reduction in muscular tension could be felt by touching. This variation lasted for about 10 days. 2 weeks later, the muscular strength of elbow extensor increased, resulting in an increased scope of movement of elbow joint. The level of joint movement was reduced, while the elbow joint bending angle at the dissection site was smaller than  $65^{\circ}$ . Observation after 3 weeks found that sudden bending of the suffered elbow joint would happen in case there were coughing reflex action and stressing. The 8 patients were visited after 8 months, their conditions did not change much, the muscular tension of affected bicep brachii increased, but it was much less than that before treatment. On the other hand, apparent strengthening of elbow extensor was observed. 4 cases showed improvement in the scope of movement of elbow joint while the other 4 remained at the level which was observed 2 weeks after treatment. Apparent improvement was demonstrated in the area of hand and arm controlling. 2 patients satisfied the ADL level which meant they were able to take care themselves. With the help of others, such as preparing clothes and meals, 2 patients managed to deal with other affairs alone. The last 2 cases showed improvement but still needed more help from others.

### **Discussion**

Treatment of elbow flexor spasm, the sequela of stroke, was always the problem

persecuting the medical clinical personnel. Up to now, there is no satisfactory treatment and drugs. Pure rehabilitation treatment is simply a time wasting, ineffective method.

Botulinum toxin belongs to bacterial exotoxin, produced by *Clostridium botulinum* during its growth and propagation. LANTOX was originally applied on the treatment of strabismus<sup>1,2</sup>, but no literature revealed its application on muscular spasm after stroke. This is the first time we carry out this method. For safety reasons, patients were only selected for treatment if: 1. they possess better general condition; 2. they can co-ordinate with the treatment; or 3. the flexor of their upper limbs show apparent spasm as well as there are serious rigid bending of elbow joint. Those who are seriously affected, hopeless to take care themselves or slightly affected patients are not included in this research.

Damaged upper motor neurons disturb the posture reflex mechanism of hemi-paralysis patients. Muscular spasm replaces the normal tension under incomplete reflex arc. Exceeding the normal muscular tension and muscular spasm are the major reasons leading to joint motion handicap. Using elbow joint as an example, as the tension of flexor (including bicep brachii, coracobrachial muscle, humeral muscle and brachioradical muscle) is too high, extensor is paralyzed, and it leads to rigid bending of elbow joint. In addition to the motion control handicap on the side of hemi-paralysis, this makes hand stretching extremely difficult. If the spasm of antagonistic muscle is relieved, the weak extensor will become relatively stronger<sup>3</sup>. The motion control mode of patients suffering from central motion damage are mainly increased tension of flexor of upper limbs, and also exceeding tension in extensor of lower limbs. When patients regain some motion controlling ability, those slight muscular spasms can be alleviated. However, if the spasm is serious and long lasting, it will not only affect the recovering of motion ability, but also increase the rigidity of relative joint, which will result in deformity.

Through the inhibition of the release of acetylcholine, botulinum toxin type A is a rapid and effective method to reduce muscular tension and strength. Its effect will last for 6 months. The effect of using rehabilitation treatment is slower but longer lasting.

We recognize that combining both LANTOX and rehabilitation treatment is the best method to cure limbs spasm after stroke, as the two methods complement each other.

During the time of LANTOX treatment, increase the training of motion ability, strengthen the ability of extensor, re-establish the coordination and control ability of flexor and extensor are all effective ways to improve the outcome of treatment, as well as

improving the qualities of lives of patients.

#### **References**

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