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SHORT COMMUNICATION

DOES BOTULINUM TOXIN A MAKE PROSTHESIS USE EASIER FOR AMPUTEES?

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Four post-amputation patients (1 with phantom pain, 3 with stump pain) were each treated with 100 IU botulinum toxin A, divided between several trigger points in the distal stump musculature. In 1 female patient (along with a pronounced reduction in phantom pain) hyperhidrosis of the stump ceased completely, probably after diffusion of the drug into the dermal sweat glands, leading to longer and safer use of the prosthesis. Intentional intradermal injection for this issue therefore could be valuable. Another patient was able to use her prosthesis for the whole day again after botulinum toxin A treatment for substantial stump pain, compared with only 4 hours a day before treatment. In 2 male patients, stump pain while wearing the prosthesis subsided to a considerable extent, 1 of the 2 reported an improvement in steadiness of gait. We suggest that stump treatment with botulinum toxin in rehabilitative medicine should be investigated in more detail.

Key words: botulinum toxin A, amputation, prosthesis.

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INTRODUCTION

The use of a prosthesis after the amputation of limbs is often limited by stump and phantom pain. Botulinum toxin has not previously been used to improve the use of limb prostheses. We recently reported an effect on phantom pain after treatment of leg amputees with botulinum toxin type A (Botox®) (BTX A) (1). Secondary findings were observed that could be of considerable interest for the rehabilitation of patients. We describe these effects on the basis of 4 case reports.

CASE REPORTS

Case 1

A 41-year-old woman had been amputated below the knee, following a motorcycle accident 3 years earlier. For her phantom pain she was treated with gabapentin, opiates and NSAID medication, but the effect was not satisfactory. Therefore, in addition, we injected 100 IU BTX A, diluted in 4 ml saline into a total of 4 muscular trigger points in the stump of the lower leg. Trigger points were identified by palpation and produced a "jump sign" and "referred pain" as described in literature. Along with a pronounced reduction in pain, in our opinion due to the BTX A treatment of muscular trigger points, the patient described a secondary effect that was just as important to her: sweating of the stump stopped completely. As BTX A was certainly injected intramuscularly, diffusion to the sweat glands must have occurred. In the years before treatment the patient had had to dry the stump at least once a day and experienced the problem of a loose prosthesis almost every day. After treatment, it was possible to wear the prosthesis all day long, and the patient reported substantial relief in this respect for the following 8 months.

Case 2

A 68-year-old woman with an above-knee amputation in 1996 after occlusive arterial disease could wear her prosthesis for only about 4 hours per day because of stump pain. The pain treatment comprised the administration of low-potency opiates and amitriptyline, eventually a peridural catheter even had to be inserted because of the pain. Three days after injection of 100 IU BTX A (4×25 IU in 1.0 ml saline) into 4 trigger points of the painful lateral thigh muscles the stump pain had decreased to such an extent that it was possible for her to wear the prosthesis again. About 2 weeks after treatment it was possible to wear the prosthesis all day long. The treatment effect lasted about 3 months and renewed injection produced the same effect again.

Case 3

A 65-year-old man, amputated following occlusive arterial disease 6 years ago, complained of severe pain in the left upper-leg stump. In particular, treatment with 100 IU BTX A (5×20 IU) reduced the spasms triggered by wearing the prosthesis. Again injection was performed into intramuscular trigger points, located by palpation which produced a "jump sign", and "referred pain". The BTX A dose was chosen to be

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comparable to that used in other painful disorders and similar to our first published experiences with phantom pain. The patient himself noticed an improvement in steadiness of gait, and his physiotherapist noted smoother movement with "more physiological arm movements" when walking with crutches. If this observation was due to the pain reduction or could represent an influence of BTX A on cortical reorganization, as discussed in our first publication (1), remains to be discussed. Subjectively, the patient reported that this also resulted in a reduction in pain in both wrists. Unfortunately, the patient could be followed-up for only 2 months.

Case 4

A 63-year-old male patient on dialysis due to diabetic nephropathy had had a below-knee amputation 6 years earlier after occlusive arterial disease. In addition to a mild diabetic neuropathy he suffered from stump pain from pronounced muscular tenderness of the amputation stump. This substantially affected both night-time sleep and his ability to wear his prosthesis. He used peripheral analgesics with limited success. After injection of 20 IU BTX A in 1.0 ml saline each into 5 trigger points (2 lateral, 1 medial, 1 anterior and 1 posterior) he was able to strike the couch several times with his stump without pain and reported improved tolerance of his prosthesis. The average pain scores on the numeric rating scale (NRS 0–10) changed from 6 to 0. Turning around during night-time sleep no longer woke him up, and his ability to walk was not influenced negatively. The effect lasted about 10 weeks.

DISCUSSION

The use of BTX A has already been described in a case report on the treatment of focal amputation stump hyperhidrosis (2). Its successful use in stump dermatitis in amputees has also been reported (3). However, insufficient attention has been paid to its significance in prosthesis use. The use of prostheses is limited by a number of problems (4), but it apparently reduces phantom pain (5, 6) and increases the chances of re-integration in the workplace (7, 8). After intramuscular administration, BTX A acts as a relaxant by inhibiting the release of acetylcholine from the motor end-plate (9) and, after intradermal administration it inhibits the action of the sweat glands by the same mechanism.

The reduction in stump pain, followed by improved prosthesis use, can be explained by the muscular relaxation, an increased muscular blood flow and by additional inhibition of the release of nociceptive transmitters (10, 11). A spinal effect (12) and influences on cortical reorganization (13, 14) as a result of reduced afference from the muscle spindles (15, 16) may also contribute and may be an explanation for the reduction in phantom pain (case 1). Relaxation of the (functionally ineffective) stump muscles was not a problem for our patients, no side-effects occurred.

With reference to the reduction in hyperhidrosis in the patient treated by us, it can be assumed that, despite the intramuscular administration, some of the drug must have reached the sweat glands in the skin by diffusion. However, it is probable that systematic intradermal administration of BTX A could improve the fit of a prosthesis in cases of hyperhidrosis.

In our opinion, the improvement in prosthesis use in the cases described should encourage more frequent use and further investigation of this treatment in patients with rehabilitative problems. Following our first experiences further studies should examine other doses, injection volumes and number of injections.

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