Modulation of involuntary movements in cerebral palsy with acupuncture

Paul Watson

This case describes the treatment of severe involuntary movements in a 10-year-old boy suffering from cerebral palsy.

Needling GB34 and ST36 bilaterally for 25 minutes resulted in immediate temporary cessation of involuntary extension contractions of the erector spinae muscles for the duration of the treatment, resulting in increased functionality in the patient. This response occurred regularly on repeated treatment, but was not maintained between treatments.

Involuntary movements are a major disabling feature of cerebral palsy, which impair quality of life and often prove difficult to treat successfully. This case is reported with the hope that this simple technique may provide relief for other patients suffering similar symptoms.

PATIENT HISTORY AND PRESENTATION

The patient is a 10-year-old boy with severe quadriplegic cerebral palsy (CP). He is predominantly dystonic, but also suffers from a strong extension pattern. His dystonia is so severe that he is unable to sit or stand unaided. He is unable to speak, but is able to swallow solid food. His vision is also severely affected. He suffers from periodic epileptic seizures.

He also has two retained primitive reflexes:

1. The Moro reflex, manifesting as instantaneous arousal, rapid inhalation, momentary “freeze”, then exhalation and emotional outburst or crying.
2. The extensor tonic labyrinthine reflex, which manifests as extension of the neck, head and arms.¹

The frequent extension spasms resulting from these reflexes are so strong that he has twice knocked out the front teeth of his mother, and has also recently broken the backs of two specialised chairs (R82 panda model). For a child weighing only 17 kg, the power generated by his spasms is phenomenal. Aside from the functional difficulties these spasms cause, it would appear that they also cause great discomfort. His range of voluntary movement is extremely limited; he is successful at grasping a marker pen offered within his reach in about 20% of attempts.

Due to his lack of mobility, and his complete reliance on his carers to move around, it would constitute a huge improvement in quality of life for this patient if he could control an electric wheelchair or any other mobility-enhancing equipment, by use of simple switches. There appear to be two factors preventing this:

1. Lack of motor coordination.
2. Constant extreme extension spasms.

ACUPUNCTURE TREATMENT

Being aware of some literature on acupuncture for CP, discussed below, I decided to see if it would help this particular young boy. In particular I was curious to see whether acupuncture would have any positive effect on either his motor coordination or extension spasms. I used points ST36 located 3 cun below the knee joint, and GB34 located in the depression anterior and inferior to the head of the fibula. I used disposable stainless steel 0.25 x 40 mm Hwato acupuncture needles (Suzhou Tianyi Acupuncture Instruments Co Ltd, Suzhou City, China) to stimulate both points bilaterally. In total four needles were used, each inserted to a depth of 1.5 cun (about 18 mm in this patient). I used a traditional Chinese style of acupuncture, manually manipulating the needles at regular intervals and retaining them for 25 minutes. The treatment was repeated twice weekly for 12 weeks. Because the effect of the treatment was so dramatic (see “Outcome”), the patient’s body posture was taken as evidence of de qi. Due to his condition, the patient has markedly decreased sensation in his legs and did not report the usual sensations of de qi, but communicated that during the treatment he could feel his legs “more than normal”.

OUTCOME

On insertion of the needles the patient’s extension contractions ceased immediately. After 25 minutes, when the needles were removed the spasmodic contractions started again, also immediately. Each time the treatment was carried out the results were almost identical. At times it appeared as if the patient’s body was just about to enter an extension spasm, but the reflex was somehow arrested. To see if the spasm had been rendered completely impossible whilst the needles were in place, I decided to see what would happen when he was emotionally excited, or tried to walk with the aid of his carer. Both of these scenarios would usually be guaranteed to induce extension contractions in this patient. I found that the reflex could be induced, but it took a much greater degree of stimulation than usual to initiate.

With the needles in place, routine tasks such as feeding and physiotherapy and simply just sitting with the patient have become much easier. He has consistently explicitly communicated that he loves the treatment and his carers say that it has greatly reduced their stress levels for the duration of the treatment. Interestingly, he has also communicated that the acupuncture has a pain-relieving effect on his back.

Problems with uninterrupted acupuncture

Because the duration of the effect of the acupuncture seemed restricted only to the time the needles were in place, I wondered how the treatment could be extended past the usual 25–30 minutes. We have experimented with intradermal acupuncture needles, inserted in the same points to a depth of 10 mm, and retained for up to 2 h. Results were unsatisfactory for two reasons. First, the reduction in extension contractions was less marked — possibly due to reduced depth of needling and/or less effective stimulation of the acupuncture point. Second, the needles soon became deformed whilst in the acupuncture point due to leg movements over this extended period of time. This led to increased bleeding from the point, which would suggest possible implications of damage to local tissue, as well as raising concerns about infection in a patient who is considered to be immunosuppressed.

DISCUSSION

For every 1000 children in the UK, more than two are born with CP: 3 — a disease which proves an enduring medical challenge; a challenge to those who suffer from it, to their families and carers.

First described by the English surgeon William Little in 1861, CP has undergone several “upgrades” in its definition. ² ³ Most recently, the International Workshop on the Definition and Classification of Cerebral Palsy (2005)
proposed a new definition and classification of CP.

Cerebral palsy describes a group of disorders of the development of movement and posture, causing activity limitation, that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain. The motor disorders of cerebral palsy are often accompanied by disturbances of sensation, cognition, communication, perception, and/or behaviour, and/or by a seizure disorder.

This definition, being much more explicit than its predecessors, paints a clearer picture of the condition. For the patient, advances in treatment are of much greater interest.

Conventional interventions
Several treatments are available for muscle spasticity, most with significant side effects. Among the most common in current use are intrathecal baclofen and intramuscular botox. More recently deep brain stimulation has been used for dystonia. In this patient intrathecal baclofen had been tried, but with no effect. Although botox had not been used to treat this patient’s erector spinae spasms, he had previously had botox injections into extensor hallucis longus to relieve chronic severe extension of the great toe. Here the effect lasted only a matter of days. Due to the severity of the child’s symptoms, his parents were considering deep brain stimulation, but were understandably concerned about possible complications of the treatment.

Acupuncture treatment of CP in the literature
Because acupuncture had been reported to be effective in alleviating some symptoms of CP in the literature, I decided to see if it would help this particular young boy, in particular with respect to his motor coordination or extension spasms.

Sanner and Sundequist reported the successful treatment of painful muscle spasms in CP by treatment with local acupuncture at “areas of abnormal muscle tenderness” after Melzack. Svedberg reported the selective reduction of spasticity in the gastrocnemius muscle of a boy with CP, also using local points.

In patients where muscle spasms or spasticity occur in the limbs, it is safe and effective to treat locally. However, where the spasms involve the long extensors of the back as a major component, local acupuncture would not be safe. In any patient, care must be taken in needling such points in order to avoid puncturing the lungs; in a very slight patient who is apt to sudden erratic movement the risk of an adverse event is greatly increased.

Back to the drawing board — traditional theory
In traditional Chinese medicine theory it is believed that “the chief signs of Liver Wind are severe dizziness and headache, iron-band sensation, tension and stiffness in the neck, tingling or numbness in the limbs, or twitching of the sinews and flesh. In serious cases... inhibited speech, or unsteady gait. In more severe cases there may be convulsive spasm or tetanic inversion”.

I noted an interesting correlation between the description of this condition and the presenting symptoms suffered by this particular patient. I decided to look to traditional Chinese medical diagnosis to select safer points that might have a similar beneficial outcome. The major factors in the patient’s condition that I wanted to address were his lack of muscular tone and his constant spasmodic contraction of the extensors in his back. This led me to select ST36, a point indicated in lack of muscle tone, and GB34, indicated in treating the syndrome known as Liver–Wind as described above.

What most surprised me in this case was the speed of onset and decline of the effect — quite different from the slower trajectory of most reported effects of acupuncture. Indeed, these qualities most resemble those of acupuncture analgesia, though perhaps even more immediate and transient. I noted that the effect attributed to GB34 (reduction in spasms) was only observed when the point was used in combination with ST36.

Like many effects of acupuncture, the results observed and described are easier to explain in the terms of traditional Chinese medicine than biomedically.

Possible mechanisms
Although speculation as to the mechanism of action in this particular case is beyond the realm of this report, it is worth noting some of the latest findings regarding acupuncture.

In a recent review article, Çabıyoglu et al19 present studies showing that acupuncture upregulation of endomorphin-1, beta-endorphin, encephalin, serotonin, and dopamine cause analgesia, sedation, and recovery in motor functions. In another review article Imich and Beyer20 presented proof of endogenous antinoceptive systems and descending inhibitory systems in short-term acupuncture analgesia.

Further elucidation on the mechanisms of acupuncture might show a correlation with mechanism of some of the current chemical treatments for involuntary movements in CP already outlined. However, at present, no such correlation has been documented.

Future research and developments
As far as improving the efficacy of this treatment is concerned, one avenue that could be explored is the use of intramuscular electrical implants. Goroszeniuk has described how subcutaneous targeted neurostimulation (STN) via a percutaneous permanent neurostimulating implant has been used for the reduction of intractable neuropathic pain. It would be interesting to observe the effect of such STN at distal acupuncture points on CP spasms.

In the future, investigation of the mechanism of both treatments might shed light on a possible correlation between pain and recurrent spastic contractions.

SUMMARY
The acupuncture treatment outlined in this report has consistently and repeatedly demonstrated its efficacy in reduction of extreme, incessant spinal extensor contractions, pain reduction, increased functionality and safety of treatment in one patient. The treatment has proved simple and safe enough that it could easily be administered, when needed, by adequately trained allied health professionals. It would be interesting to see whether the same treatment would provide similar benefits to others suffering from same debilitating extensor spasms.

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