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Benefits of Temporary Intrathecal Baclofen Therapy: Management of Tone and Spasticity

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Abstract

Background: Our objectives are to report the efficacy and safety of intrathecal baclofen (ITB) therapy for the temporary treatment of spasticity and dystonia, and to illustrate the benefit of temporary ITB therapy while patients are in rehabilitation.

Methods: This is a retrospective case series of three patients with spasticity and dystonia who were treated with ITB. All patients had their pump and catheter explanted after their movement disorder resolved and their abilities improved, and they were slowly weaned off ITB.

Results: ITB therapy prevented the development of complications related to inadequately treated spasticity and dystonia. All patients improved clinically to the extent where the ITB could be tapered off and discontinued. Each patient had their pump and catheter hardware explanted successfully.

Conclusions: ITB therapy is effective in decreasing complications associated with hypertonicity and spastic dystonia. Removal of hardware is feasible for patients with clinical improvement after careful, decreasing titration of baclofen thereby avoiding withdrawal symptoms.

Keywords

Dystonia, Intrathecal Baclofen Therapy, ITB, Spasticity, Spastic Dystonia

Abbreviations

Intrathecal baclofen (ITB), Ashworth Scale (AS), Central Nervous System (CNS), Gamma aminobutyric acid (GABAB), Spinal Cord Injury (SCI)

Introduction

Spasticity and dystonia may develop as a consequence of brain or spinal cord injury (SCI) [1-8]. Central nervous system (CNS) injury may be permanent or temporary, depending on the etiology of brain or spinal cord injury. In anoxic brain injury, there may be transient or reactive demyelination due to cell death or cell dysfunction. If there is ischemia without true infarction, or cell death, there may be some ability of the brain to repair itself or reconstitute the myelination of axons within the white matter of the brain. There also may be some degree of plasticity of the brain to reassign functional capacities that may be retained into young adulthood.

Baclofen is a muscle relaxant medication used for the treatment of patients diagnosed with spasticity and dystonia [9]. This gamma aminobutyric acid B ($GABA_B$) receptor agonist acts in the dorsal horn of the spinal cord and causes an inhibitory influence on the alpha motor neurons [2,10-15]. The increased inhibition between the CNS and the muscles ultimately leads to the reduction of spasticity and dystonia [5,13,16]. Baclofen also acts by reversing brainstem reflex excitability observed in patients with SCI [11,13,15,17]. Oral baclofen absorbed through the intestinal lining and then into the blood, must cross the blood brain barrier and has limited efficacy because of poor penetration [15]. When patients have medically intractable spasticity or dystonia, then ITB should be considered [2,6,15,16,18].

We present a small case series of three patients treated with ITB who all improved to such an extent, that they wanted their ITB hardware explanted. Temporary ITB provided temporary and timely reduction in tone and dystonia, so that their rehabilitation was optimized.

Case Reports

Case 1

A 17-year old healthy male suffered an anoxic brain injury after a drug overdose. He developed dystonic posturing, spastic quadriparesis and contractures despite physical therapy, oral baclofen (120 mg daily) and botulinum toxin injections performed by his physiatrist. He developed dislocation and subluxation of his right shoulder. 18 months after his injury, his spasticity was a 3/5 in his upper extremities and 4/5 in his lower extremities as per the Ashworth Scale (AS). After a successful test dose, the patient underwent implantation of an ITB pump with a spinal catheter. Physical therapy was restarted as an inpatient and the patient was transferred to acute, inpatient rehabilitation. The patient's spastic paraparesis improved to a 2/5 on the AS score. He continued to make functional improvements, including attending college classes, and he was ambulating with a walker. Four years post-pump implantation, the patient requested the pump to be removed. His daily ITB dose had been slowly titrated down to 24 µg daily over several months. The patient did well after surgery and has maintained his independent, ambulatory neurological status.

Case 2

A 41-year old woman suffered an intracerebral hemorrhage

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and vasospasm. She developed post-hemorrhagic hydrocephalus, in addition to severe spastic dystonia and quadriparesis measured to be 4/5 as per the AS score. Approximately 24 months after the initial event, she underwent a test dosage and ITB was initiated. The patient tolerated the surgical implantation well and was transferred to acute, in-patient rehabilitation. A marked improvement in the patient's spasticity was noted to be 1 to 2/5 throughout at 191 µg of ITB daily. Post-ITB, the patient made significant functional improvements. Her ability to walk long distances with a walker increased. At four years post-ITB initiation, no residual spasticity was documented, a 1/5 according to the AS score. Five years after the pump was placed, the patient was weaned off of ITB and the pump was removed. The patient continued to make significant progress and is able to walk without a walker.

Case 3

A 13-year old boy suffered a traumatic commotio cordis after a baseball line-drive to the chest, and anoxic brain damage. This lead to severe spastic quadriparesis and spastic dystonia. The patient went to inpatient rehabilitation and was then discharged with aggressive outpatient therapies, and oral valium and baclofen. His physiatrist referred him for ITB after five months of uncontrollable spasticity, spastic dystonia and developing contractures. His spasticity was a 3/5 in his upper extremities and 4/5 in his lower extremities as per the AS score. ITB therapy was initiated after a successful test dose. Post-operatively, the child was sent back for more acute, in-patient rehabilitation. Three years after ITB initiation, the ambulatory patient and his family requested to have the pump removed. The patient's spastic quadriparesis significantly improved over that time span to 1/5 as per the AS in all extremities. The patient was weaned off of ITB and the pump and catheter were explanted without complication. The patient continued to improve.

Discussion

Spasticity and dystonia are frequent complications of brain or spine injury. Most patients are treated with physical therapy and oral medications without adequate control of symptomatology. However, for patients with medically intractable spasticity and dystonia, ITB therapy can be used for short or long term duration. It is best to start therapy before severe contractures develop.

All of our patients had a significant reduction of their spasticity and dystonia, and gained more independent mobility. They made significant functional gains. Reduction of dystonia and dysarthria were also noted by patients and their families. Three to five years following ITB, all patients no longer required ITB therapy, and had their hardware explanted without complication. Patients were followed annually for three years, by the senior neurosurgeon and more often by their physiatrist, after hardware explantation. The three patients have no spasticity, dystonia or long term complications after explantation.

The efficacious use of ITB therapy following brain or spine injury is well documented. In a study of 18 pediatric and adult patients with spasticity of supraspinal origin, continuous ITB was recommended following a traumatic or hypoxic brain event [1]. The article reports that patients were initially given oral antispasmodic medication without relief. However, due to multiple parts of the patients' bodies being affected by spasticity, other less invasive treatments such alcohol blocks and botulinum toxin injections were not administered [1]. A reduction of patient's spasticity decreased according to the AS score from 4.5/5 to 2.33/5 [1]. Therefore, it could be inferred that a significant improvement in the patients', as well as their caretakers' quality of life was made following ITB pump placement [1].

There is also scientific literature regarding recommended treatments for spasticity and dystonia after stroke [19-21]. Wissel et al. reports that approximately 25% of stroke patients experienced increased muscle tone not long after their anoxic event [22]. Patients that developed post-stroke spasticity tended to have more pain, and a reduced quality and ease of life [20,21]. Dietz et al. discusses that physicians often feel constricted with the treatment options available for these patients with muscle disorders [23]. Too often their spasticity becomes worse over time, resulting in decreased dexterity, and an increased dependence and burden for their caretakers [23,24]. Currently, a majority of the management for post-stroke patients with spasticity are based off of cerebral palsy and multiple sclerosis studies [20,24]. Dietz et al. suggests that treatment of these patients should be concentrated on re-gaining the patient's independence, in addition to preventing the development of complications [23]. Anti-spastic drug therapy such as ITB therapy has the potential to decrease muscle tone, and consequently improve the care for these patients [21,23].

Removal of the ITB pump and catheter after improvement of spasticity and dystonia is feasible and safe. Clinicians must carefully taper the patient off of the ITB slowly prior to the surgical explantation. Each patient underwent a weaning schedule that was as prescribed by the physiatrist and involved a 15% decrease every month until the intrathecal dose was less than 75 µg per day. The pumps were set at a "minimum infusion rate" for one month before surgical hardware explanation was scheduled to prevent damage of the device caused by the pump rotor [7]. Unlike in true ITB withdrawal, none of our patients experienced acute withdrawal symptoms because, of the slowly decreasing titration [5,9]. Many publications report the effectiveness of ITB for reducing tone, spasticity and dystonia associated with brain or spine injury [1-4,7,14]. However, we found only one report of baclofen pump explantation in patients after improved spasticity [3]. The management of patients with spasticity can improve if ITB therapy is implemented as a therapeutic intervention earlier rather than after an inadequate response to other treatment modalities are noted.

Conclusion

1. Early ITB is recommended for patients with medically intractable spasticity and dystonia.

2. Select patients with clinical improvement of their symptomatology may be safely weaned off ITB with slow tapering, if ITB is no longer necessary.

3. Pumps and catheters can be safely explanted.

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None

Declaration of Interest

The authors report no declarations of interest.

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