New Approaches to Managing Spasticity in Children With Cerebral Palsy

CEREBRAL PALSY is the most common childhood physical disability, affecting as many as 1 in 400 children. This nonprogressive disorder of movement and posture is caused by varied congenital, structural, and acquired insults to the central nervous system, generally within the first three years of maturation. Patients show various patterns of spasticity, rigidity, dystonia, tremors, ataxia, weakness, and primitive movement patterns with poor motor control and postural responses. Secondary musculoskeletal complications such as contractures, hip instability, and spinal deformity also impede function. Spasticity, characterized by velocity dependent increase in tonic stretch reflexes and exaggerated tendon jerks, is a major cause of impairment and disability.

Treatment approaches for spasticity in cerebral palsy have traditionally included physical and occupational therapy; the use of oral medications such as diazepam, dantrolene sodium, and baclofen; intramuscular chemical neurolysis with phenol or ethanol; and permanent ablative neurosurgical procedures such as selective dorsal rhizotomy. Physical and occupational therapies have limited effects on spasticity. Oral medications have systemic side effects and limited efficacy, particularly in persons with cerebral palsy. Whereas rhizotomy alleviates spasticity in cerebral palsy, spasticity reduction cannot be titrated, resulting in excessive hypotonia in some patients. The intramuscular administration of botulinum toxin for focal spasticity and continuous intrathecal baclofen infusion for generalized spasticity are useful new techniques for managing this disorder in children with cerebral palsy.

Administering purified, commercially prepared botulinum toxin into a spastic muscle results in a temporary (3 to 6 months) reduction in spasticity. Botulinum toxin acts at the neuromuscular junction, preventing the presynaptic release of acetylcholine, thus resulting in functional denervation. In contrast to phenol or alcohol, botulinum toxin can be given without anesthesia, electrical stimulation is not usually required to locate injection sites, and the procedure is no more painful than administering saline solution. Although botulinum toxin is the most potent biologic neurotoxin known, its use for the treatment of disorders such as dystonia, blepharospasm, strabismus, and spasticity has not been reported to cause serious systemic toxic effects. Compared with the administration of phenol or alcohol, botulinum toxin is less painful and is easier to administer. The medication is more expensive, but this is offset by decreased physician time and the absence of anesthesia costs in some children. Repeated administrations can induce eventual antibody formation and decrease efficacy, but spacing serial injections at least two to three months apart may prevent this problem.

Continuous intrathecal baclofen infusion using a refillable, programmable, implanted pump can reduce upper and lower extremity spasticity in patients with cerebral palsy. Baclofen is a γ-aminobutyric acid agonist acting primarily at the spinal cord level, but it crosses the blood-brain barrier poorly. Oral administration at higher doses may result in serious systemic side effects. Intrathecal infusion results in a substantial increase in cerebrospinal fluid concentrations and a manifold increase in spasticity reduction at about 1/100th the daily oral dosage. Candidates for continuous intrathecal baclofen infusion are identified through clinical examination. Efficacy is determined for a specific patient by an intrathecal trial of a bolus of baclofen given through a spinal needle or intrathecal catheter. If the spasticity responds to the trial bolus, the programmable pump is placed in the subcutaneous fat of the lower abdomen and connected to a catheter extending into the intrathecal space. Subsequently, the infusion rate can be adjusted periodically with the use of a computer-controlled, radiotelemetry programmer.

Continuous intrathecal pump infusion of baclofen is highly effective in reducing generalized spasticity in cerebral palsy. Compared with selective dorsal rhizotomy, the pump offers the advantage of titratable spasticity reduction, making it more suitable for patients with underlying weakness who rely on some degree of spasticity to ambulate or perform transfers. In addition, titrating to a higher dose may possibly allow greater upper extremity spasticity reduction. The pump reservoir requires percutaneous refilling every two to three months, and the pump is easily replaced surgically every four to five years, which is the approximate battery life.

Botulinum toxin is currently being used by many clinicians for spasticity reduction. Intrathecal baclofen infusion is approved by the Food and Drug Administration for the management of spasticity of spinal and cerebral origin in patients aged 4 years and older. When applied appropriately, both treatments appear to be promising adjuncts to other interventions for enhancing function in cerebral palsy.

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New Drugs for Improving Injury Outcome in Spinal Cord Injuries

TRAUMATIC SPINAL CORD INJURY induces the local release of chemical mediators, neurotransmitters, ions, opioids, and chemotactic factors that add chemical and biologic