CEREBRAL PALSY: A MINI REVIEW

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ABSTRACT:

Cerebral palsy is non-progressive motor disability which is caused by abnormal development or damage in one or more parts of the brain that control muscle tone and motor activity (movement). This lesion is static, the manifestation of the disorder and the needs of the individual changes with age. It may involve muscle stiffness (spasticity), poor muscle tone, uncontrolled movements, and problems with posture, balance, coordination, walking, speech, swallowing, and many other functions. Motor performance is normally coordinated via communication between the cerebral cortex, thalamus, basal ganglia, brain stem, cerebellum, spinal cord and communicating sensory motor pathways. Mental retardation, seizures, breathing problems, bladder and bowel control problems, learning disabilities, skeletal deformities, dental problems, eating difficulties, digestive problems, and hearing and vision problems are also linked with this disorder. Cerebral palsy is non- curable in the accepted sense although several measures such as proper education, therapy and applied technology are being used to help persons who are suffering from this disorder and provide them productive lives. In order to approach cerebral palsy systematically, the medical practioners and physical therapists need to recognize neuromotor deficits, diagnose and classify the type of disorder, and implement a methodical treatment plan. The purpose of this article is to review the etiology, pathophysiology, diagnostic classification, clinical manifestations, and therapeutic management of cerebral palsy.

Keywords: cerebral palsy, brain damage, spastic, Baclofen.

INTRODUCTION:

"Cerebral" refers to the brain and "Palsy" to a disorder of movement or posture. Cerebral palsy is the term used to describe a group of chronic conditions affecting body movements and muscle coordination. It is caused by damage to one or more specific areas of the brain that control muscle tone and motor activity. The resulting impairments first appear early in life, usually occurring during fetal development or infancy. It also can occur before, during or shortly following birth. Children with cerebral palsy may not be able to walk, talk, eat or play in the same ways as most other children. The incidence of CP is usually 0.15 to 0.3% of the general population (compared to a 3% incidence of mental retardation). The worldwide incidence of CP is approximately 2 to 2.5/1000 live births. The incidence is strongly associated with gestational age, occurring in 1 of 20 surviving preterm infants. Cerebral palsy is neither progressive nor communicable. It is also not "curable" in the accepted sense, although education, therapy and applied technology can help persons with cerebral palsy lead productive lives. It is important to know that cerebral palsy is not a disease or illness. It isn't contagious and it doesn't get worse. Children who have cerebral palsy will have it all their lives. [1]

EPIDEMIOLOGY

In the industrialized world, the prevalence of cerebral palsy is about 2 per 1000 live births. The incidence is higher in males than in females; the Surveillance of Cerebral Palsy in Europe (SCPE) reports a M: F ratio of 1.33:1.[2] In the United States, approximately 10,000 infants and babies are diagnosed with CP each year, and 1200–1500 are diagnosed at preschool age. Prevalence of cerebral palsy is best calculated around the school entry age of about six years, the prevalence in the U.S. is estimated to be 2.4 out of 1000 children.[3]

The SCPE reported the following incidence of comorbidities in children with CP (over 4,500 children over age 4 whose CP was acquired during the prenatal or neonatal period were included):

Mental disadvantage (IQ < 50): 31%, active seizures: 21%

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Mental disadvantage (IQ < 50) and not walking: 20%

Blindness: 11%.

The SCPE noted that the incidence of co morbidities is difficult to measure accurately, particularly across centers.

HISTORY OF CEREBRAL PALSY IN CHILDREN

Cerebral palsy is not a new disorder. But the medical profession did not begin to study cerebral palsy as a distinct medical condition until 1861. In that year, an English orthopedic surgeon, Dr. William John Little, published the first paper describing the neurological problems of children with spastic diplegia. Spastic diplegia is still sometimes called Little's Disease. This was a disorder that struck children in the first years of life, characterized by stiff, spastic muscles in their arms and legs. These children had difficulty in grasping objects, crawling and walking. The term cerebral palsy came into use in the late 1800's. Sir William Osler, a British medical doctor, is believed to have coined the term. Dr. Sigmund Freud, the Austrian neurologist better known for his work in psychiatry, published some of the earliest medical papers on cerebral palsy. In the early years, Dr. Little believed most cases of cerebral palsy were caused by obstetrical complications at birth. He suggested that children born with cerebral palsy were born following complicated deliveries, and that their condition was a result of lack of oxygen to the brain. He said this oxygen shortage damaged sensitive brain tissues controlling movement. But in the late 1800's, Freud disagreed. Noting that children with cerebral palsy often had other problems such as mental retardation, visual disturbances, and seizures, Freud suggested that the disorder might be caused earlier in life, during the brain's development in the womb. In the 1980's, scientists analyzed extensive data from a government study of more than 35,000 births. While they found that birth trauma was the cause of thousands of cerebral palsy cases, no cause could be found in the majority of cases. This has influenced researchers to explore other causes, and look at medical theories about cerebral palsy more closely. [4]

CLASSIFICATION OF CEREBRAL PALSY

1) Spastic cerebral palsy:

Spastic cerebral palsy is by far the most common type of overall cerebral palsy, occurring in 80% of all cases.[5] People with this type of CP are hypertonic and have what is essentially a neuromuscular mobility (rather than hypotonia or paralysis) stemming from an upper motor neuron lesion in the brain as well as the corticospinal tract or the motor cortex. This damage impairs the ability of some nerve receptors in the spine to properly receive gamma amino butyric acid, leading to hypertonia in the muscles signaled by those damaged nerves.

Spastic cerebral palsy is further classified as:

- Spastic hemiplegia: in this one side is affected. Generally, injury to muscle-nerves controlled by the brain's left side will cause a right body deficit, and vice versa. [6]
- Spastic diplegia: in this the lower extremities are affected, with little to no upper-body spasticity. The most common form of the spastic forms (70-80% of known cases), most people with spastic diplegia are fully ambulatory, but are "tight" and have a scissors gait. Flexed knees and hips to varying degrees, and moderate to severe adduction (stemming from tight adductor muscles and comparatively weak abductor muscles), are present. Over time, the effects of the spasticity sometimes produce hip problems and dislocations (see the main article and spasticity for more on spasticity effects). In three-quarters of spastic diplegics, also strabismus (crossed eyes) can be present as well.
- Spastic monoplegia: in this one single limb being is affected.
- Spastic triplegia: In these three limbs being is affected.
- Spastic quadriplegia: in this all four limbs more or less equally are affected. People with spastic quadriplegia are the least likely to be able to walk, or if they can, to desire to walk, because their muscles are too tight and it is too much of an effort to do so. Some children with spastic quadriplegia also have hemiparetic tremors, an uncontrollable shaking that affects the limbs on one side of the body and impairs normal movement.

2) Ataxic cerebral palsy:

This rare type of cerebral palsy affects balance and depth perception. Children will often have poor coordination and walk unsteadily with a wide-based

gait, placing their feet unusually far apart. They have difficulty with quick or precise movements, such as writing or buttoning a shirt. They may also have intention tremor, in which a voluntary movement, such as reaching for a book, is accompanied by trembling that gets worse the closer their hand gets to the object.

3) Dyskinetic cerebral palsy:

Dyskinetic cerebral palsy is mixed tone both hypertonia and hypotonia mixed with involuntary motions. People with Dyskinetic CP have trouble holding themselves in an upright, steady position for sitting or walking, and often show involuntary motions. The damage occurs to the extra pyramidal motor system and/or pyramidal tract and to the basal ganglia.[7]

SIGNS AND SYMPTOMS

The signs of cerebral palsy are usually not noticeable in early infancy but become more obvious as the child's nervous system matures. Problems and disabilities related to CP range from very mild to very severe. Their severity is related to the severity of the brain damage. They may be very subtle, noticeable only to medical professionals, or may be obvious to the parents and other caregivers. The signs include the following:

1) Delayed milestones such as controlling head, rolling over, reaching with one hand, sitting without support, crawling, or walking.
2) Abnormal muscle tone: Muscles may be very stiff (spastic) or unusually relaxed and "floppy." Limbs may be held in unusual or awkward positions
3) Abnormal movements: Movements may be unusually jerky or abrupt, or slow and writhing. They may appear uncontrolled or without purpose.
4) Skeletal deformities: People who have cerebral palsy on only one side may have shortened limbs on the affected side. If not corrected by surgery or a device, this can lead to tilting of the pelvic bones and scoliosis (curvature of the spine).
5) Joint contractures: People with spastic cerebral palsy may develop severe stiffening of the joints because of unequal pressures on the joints exerted by muscles of differing tone or strength.
6) Mental retardation: Some, although not all, children with cerebral palsy are affected by mental retardation. Generally, the more severe the retardation, the more severe the disability overall.
7) Seizures: About one third of people with cerebral palsy have seizures. Seizures may appear early in life or years after the brain damage that causes cerebral palsy. The physical signs of a seizure may be partly masked by the abnormal movements of a person with cerebral palsy.
8) Speech problems: Speech is partly controlled by movements of muscles of the tongue, mouth, and throat. Some individuals with cerebral palsy are unable to control these muscles and thus cannot speak normally.
9) Swallowing problems: Swallowing is a very complex function that requires precise interaction of many groups of muscles. People with cerebral palsy who are unable to control these muscles will have problems sucking, eating, drinking, and controlling their saliva. They may drool. An even greater risk is aspiration, the inhalation into the lungs of food or fluids from the mouth or nose. This can cause infection or even suffocation.
10) Hearing loss: Partial hearing loss is not unusual in people with cerebral palsy. The child may not respond to sounds or may have delayed speech.
11) Vision problems: Three quarters of people with cerebral palsy have strabismus, which is the turning in or out of one eye. This is due to weakness of the muscles that control eye movement. These people are often nearsighted. If not corrected, strabismus can lead to more severe vision problems over time.
12) Dental problems: People with cerebral palsy tend to have more cavities than usual. This results from both defects in tooth enamel and difficulties brushing the teeth.
13) Bowel and/or bladder control problems: These are caused by lack of muscle control.[8]

CAUSES:

The majority of children with cerebral palsy are born with it, although it may not be detected until months or years later. This is called *congenital*

cerebral palsy. In the past, if doctors couldn't identify another cause, they attributed most cases of congenital cerebral palsy to problems or complications during labor that caused *asphyxia* (a lack of oxygen) during birth. However, extensive research has shown that few babies who experience asphyxia during birth grow up to have cerebral palsy or any other neurological disorder. Birth complications, including asphyxia, are now estimated to account for only 5 to 10 percent of the babies born with congenital cerebral palsy. [9, 10]

Damage to the white matter of the brain (periventricular leukomalacia [PVL]). The white matter of the brain is responsible for transmitting signals inside the brain and to the rest of the body. PVL describes a type of damage that looks like tiny holes in the white matter of an infant's brain. These gaps in brain tissue interfere with the normal transmission of signals. There are a number of events that can cause PVL, including maternal or fetal infection.

Abnormal development of the brain (cerebral dysgenesis). Any interruption of the normal process of brain growth during fetal development can cause brain malformations that interfere with the transmission of brain signals. The fetal brain is particularly vulnerable during the first 20 weeks of development. Mutations in the genes that control brain development during this early period can keep the brain from developing normally. Infections, fevers, trauma, or other conditions that cause unhealthy conditions in the womb also put an unborn baby's nervous system at risk.

Bleeding in the brain (intracranial hemorrhage). Intracranial hemorrhage describes bleeding inside the brain caused by blocked or broken blood vessels. A common cause of this kind of damage is fetal stroke. Some babies suffer a stroke while still in the womb because of blood clots in the *placenta* that block blood flow. Other types of fetal stroke are caused by malformed or weak blood vessels in the brain or by blood-clotting abnormalities. Maternal high blood pressure (hypertension) is a common medical disorder during pregnancy that has been known to cause fetal stroke. Maternal infection, especially pelvic inflammatory disease, has also been shown to increase the risk of fetal stroke.[11]

Brain damage caused by a lack of oxygen in the brain (hypoxic-ischemic encephalopathy or intrapartum asphyxia). Asphyxia, a lack of oxygen in the brain caused by an interruption in breathing or poor oxygen supply, is common in babies due to the stress of labor and delivery. But even though a newborn's blood is equipped to compensate for short-term low levels of oxygen, if the supply of oxygen is cut off or reduced for lengthy periods, an infant can develop a type of brain damage called hypoxic-ischemic encephalopathy, which destroys tissue in the cerebral motor cortex and other areas of the brain. This kind of damage can also be caused by severe maternal low blood pressure, rupture of the uterus, detachment of the placenta, or problems involving the umbilical cord. [12]

DIAGNOSIS:

There is no medical test that confirms the diagnosis of cerebral palsy. The diagnosis is made on the basis of various types of information gathered by the child's health care provider and, in some cases, other consultants. This information includes a detailed medical interview concerning medical histories of both mother's and father's families, the mother's medical problems before and during pregnancy, and a detailed account of the pregnancy, labor, delivery, and neonatal (newborn) period.

Some of the major laboratory diagnosis tests include the following:

1) Ultrasound of the brain: Ultrasound uses harmless sound waves to detect certain types of structural and anatomic abnormalities. For instance, it can show hemorrhage (bleeding) in the brain or damage caused by lack of oxygen to the brain.

2) CT scan of the brain: This scan is similar to an x-ray but shows greater detail and gives a more 3-dimensional image. It identifies malformations, hemorrhage, and certain other abnormalities in infants more clearly than ultrasound.

3) MRI of the brain: This is the preferred test, since it defines brain structures and abnormalities more clearly than any other method.

4) MRI of the spinal cord: This may be necessary in children with spasticity of the legs and worsening of bowel and bladder function, which suggest an abnormality of the spinal cord. [13]

5) Electroencephalography (EEG) is important in the diagnosis of seizure disorders. A high index of suspicion is needed in order to detect non-convulsive or minimally convulsive seizures. This is a potentially treatable cause of a CP-look-alike, which is easier to treat when treated early.[14]

6) Electromyography (EMG) and nerve conduction studies (NCS) may be helpful in distinguishing CP from other muscle or nerve disorders.[15]

TREATMENT

There is no standard therapy that works for every individual with cerebral palsy. Once the diagnosis is made, and the type of cerebral palsy is determined, a team of health care professionals will work with a child and his or her parents to identify specific impairments and needs, and then develop an appropriate plan to tackle the core disabilities that affect the child's quality of life.

A comprehensive management plan will pull in a combination of health professionals with expertise in the following:

Physical therapy, usually begun in the first few years of life or soon after the diagnosis is made, is a cornerstone of cerebral palsy treatment. Physical therapy programs use specific sets of exercises and activities to work toward two important goals: preventing weakening or deterioration in the muscles that aren't being used (*disuse atrophy*), and keeping muscles from becoming fixed in a rigid, abnormal position (*contracture*). Resistive exercise programs (also called strength training) and other types of exercise are often used to increase muscle performance, especially in children and adolescents with mild cerebral palsy. Daily bouts of exercise keep muscles that aren't normally used moving and active and less prone to wasting away. Exercise also reduces the risk of contracture, one of the most common and serious complications of cerebral palsy. Normally growing children stretch their muscles and tendons as they run, walk, and move through their daily activities. This insures that their muscles grow at the same rate as their bones. But in children with cerebral palsy, spasticity prevents muscles from stretching. As a result, their muscles don't grow fast enough to keep up with their lengthening bones. The muscle contracture that results can set back the gains in function they've made. Physical therapy alone or in combination with special braces (called *orthotic devices*) helps prevent contracture by stretching spastic muscles.[16]

Occupational therapy. This kind of therapy focuses on optimizing upper body function, improving posture, and making the most of a child's mobility. An occupational therapist helps a child master the basic activities of daily living, such as eating, dressing, and using the bathroom alone. Fostering this kind of independence boosts self-reliance and self-esteem, and also helps reduce demands on parents and caregivers.[17]

Recreational therapies. Recreational therapies, such as therapeutic horseback riding (also called hippotherapy), are sometimes used with mildly impaired children to improve gross motor skills. Parents of children who participate in recreational therapies usually notice an improvement in their child's speech, self-esteem, and emotional well-being.

Speech therapies. About 20 percent of children with cerebral palsy are unable to produce intelligible speech. They also experience challenges in other areas of communication, such as hand gestures and facial expressions, and they have difficulty participating in the basic give and take of a normal conversation. These challenges will last throughout their lives. Speech and language therapists (also known as speech therapists or speech-language pathologists) observe, diagnose, and treat the communication disorders associated with cerebral palsy. They use a program of exercises to teach children how to overcome specific communication difficulties. Speech interventions often use a child's family members and friends to reinforce the lessons learned in a therapeutic setting. This kind of indirect therapy encourages people who are in close daily contact with a child to create opportunities for him or her to use their new skills in conversation.[18]

Treatments for problems with eating and drooling are often necessary when children with cerebral palsy have difficulty eating and drinking because they have little control over the muscles that move their mouth, jaw, and tongue. They are also at risk for breathing food or fluid into the lungs. Some children develop *gastro esophageal reflux disease* (GERD, commonly called heartburn) in which a weak diaphragm can't keep stomach acids from spilling into the esophagus. The irritation of the acid can cause bleeding and pain. Individuals with cerebral palsy are also at risk for malnutrition, recurrent lung infections, and progressive lung

disease. The individuals most at risk for these problems are those with spastic quadriplegia. Initially, children should be evaluated for their swallowing ability, which is usually done with a modified barium swallow study. Recommendations regarding diet modifications will be derived from the results of this study. In severe cases where swallowing problems are causing malnutrition, a doctor may recommend tube feeding, in which a tube delivers food and nutrients down the throat and into the stomach, or gastrostomy, in which a surgical opening allows a tube to be placed directly into the stomach. Although numerous treatments for drooling have been tested over the years, there is no one treatment that helps reliably. *Anticholinergic drugs*—such as glycopyrolate--can reduce the flow of saliva but may cause unpleasant side effects, such as dry mouth, constipation, and urinary retention. Some children benefit from biofeedback techniques that help them recognize more quickly when their mouths fall open and they begin to drool. [19]

Drug treatments

Oral medications such as diazepam, baclofen, dantrolene sodium, and tizanidine are usually used as the first line of treatment to relax stiff, contracted, or overactive muscles. These drugs are easy to use, except that dosages high enough to be effective often have side effects, among them drowsiness, upset stomach, high blood pressure, and possible liver damage with long-term use. Oral medications are most appropriate for children who need only mild reduction in muscle tone or who have widespread spasticity. The availability of new and more precise methods to deliver antispasmodic medications is moving treatment for spasticity toward *chemo denervation*, in which injected drugs are used to target and relax muscles.[20]

Botulinum toxin (BT-A), injected locally, has become a standard treatment for overactive muscles in children with spastic movement disorders such as cerebral palsy. BT-A relaxes contracted muscles by keeping nerve cells from over-activating muscle. Although BT-A is not approved by the Food and Drug Administration (FDA) for treating cerebral palsy, since the 1990s doctors have been using it *off-label* to relax spastic muscles. A number of studies have shown that it reduces spasticity and increases the range of motion of the muscles it targets.

The relaxing effect of a BT-A injection lasts approximately 3 months. Undesirable side effects are mild and short-lived, consisting of pain upon injection and occasionally mild flu-like symptoms. BT-A injections are most effective when followed by a stretching program including physical therapy and splinting. BT-A injections work best for children who have some control over their motor movements and have a limited number of muscles to treat, none of which is fixed or rigid.

Because BT-A does not have FDA approval to treat spasticity in children, parents and caregivers should make sure that the doctor giving the injection is trained in the procedure and has experience using it in children.[21]

Intrathecal baclofen therapy uses an implantable pump to deliver baclofen, a muscle relaxant, into the fluid surrounding the spinal cord. Baclofen works by decreasing the excitability of nerve cells in the spinal cord, which then reduces muscle spasticity throughout the body. Because it is delivered directly into the nervous system, the intrathecal dose of baclofen can be as low as one one-hundredth of the oral dose. Studies have shown it reduces spasticity and pain and improves sleep.[22]

Surgery

Orthopedic surgery is often recommended when spasticity and stiffness are severe enough to make walking and moving about difficult or painful. For many people with cerebral palsy, improving the appearance of how they walk--their gait--is also important. A more upright gait with smoother transitions and foot placements is the primary goal for many children and young adults.

In the operating room, surgeons can lengthen muscles and tendons that are proportionately too short. But first, they have to determine the specific muscles responsible for the gait abnormalities. Gait analysis uses cameras that record how an individual walks, force plates that detect when and where feet touch the ground, a special recording technique that detects muscle activity (known as *electromyography*), and a computer program that gathers and analyzes the data to identify the problem muscles. Using gait analysis, doctors can precisely locate which muscles would benefit from surgery and how much improvement in gait can be expected.[23]

Selective dorsal rhizotomy (SDR) is a surgical procedure recommended only for cases of severe spasticity when all of the more conservative treatments--physical therapy, oral medications, and

intrathecal baclofen--have failed to reduce spasticity or chronic pain. In the procedure, a surgeon locates and selectively severs over activated nerves at the base of the spinal column. Because it reduces the amount of stimulation that reaches muscles via the nerves, SDR is most commonly used to relax muscles and decrease chronic pain in one or both of the lower or upper limbs. It is also sometimes used to correct an overactive bladder. Potential side effects include sensory loss, numbness, or uncomfortable sensations in limb areas once supplied by the severed nerve.

Spinal cord stimulation was developed in the 1980s to treat spinal cord injury and other neurological conditions involving motor neurons. An implanted electrode selectively stimulates nerves at the base of the spinal cord to inhibit and decrease nerve activity. The effectiveness of spinal cord stimulation for the treatment of cerebral palsy has yet to be proven in clinical studies. It is considered a treatment alternative only when other conservative or surgical treatments have been unsuccessful at relaxing muscles or relieving pain.

Orthotic devices

Orthotic devices--such as braces and splints--use external force to correct muscle abnormalities. The technology of orthotics has advanced over the past 30 years from metal rods that hooked up to bulky orthopedic shoes, to appliances that are individually molded from high-temperature plastics for a precise fit. Ankle-foot orthoses are frequently prescribed for children with spastic diplegia to prevent muscle contracture and to improve gait. Splints are also used to correct spasticity in the hand muscles.[24]

Assistive technology

Devices that help individuals move about more easily and communicate successfully at home, at school, or in the workplace can help a child or adult with cerebral palsy overcome physical and communication limitations. There are a number of devices that help individuals stand straight and walk, such as postural support or seating systems, open-front walkers, quadrapedal canes (lightweight metal canes with four feet), and gait poles. Electric wheelchairs let more severely impaired adults and children move about successfully.

The computer is probably the most dramatic example of a communication device that can make a big difference in the lives of people with cerebral palsy. Equipped with a computer and voice synthesizer, a child or adult with cerebral palsy can communicate successfully with others. For example, a child who is unable to speak or write but can make head movements may be able to control a computer using a special light pointer that attaches to a headband.[25]

Hyperbaric oxygen therapy (HBOT), in which pressurized oxygen is inhaled inside a hyperbaric chamber, has been studied under the theory that improving oxygen availability to damaged brain cells can reactivate some of them to function normally. A 2007 systematic review concluded that treatment with HBOT showed no significant difference from that of pressurized room air, and that some children undergoing HBOT may experience adverse events such as seizures and the need for ear pressure equalization tubes; due to poor quality of data assessment the review also concluded that estimates of the prevalence of adverse events are uncertain.[26]

Treatments for other conditions associated with cerebral palsy

Epilepsy**:** Twenty to 40 percent of children with mental retardation and cerebral palsy also have epilepsy. Doctors usually prescribe medications to control seizures. The classic medications for this purpose are phenobarbital, phenytoin, carbamazepine, and valproate. Although these drugs generally are effective in controlling seizures, their use is hampered by harmful or unpleasant side effects.[27]

Incontinence**:** Medical treatments for incontinence include special exercises, biofeedback, prescription drugs, surgery, or surgically implanted devices to replace or aid muscles. Specially designed absorbent undergarments can also be used to protect against accidental leaks.

Osteopenia**:** Children with cerebral palsy, who aren't able to walk risk developing poor bone density (osteopenia), which make them more likely to break bones. In a study of older Americans funded by the National Institutes of Health (NIH), a family of drugs called *bisphosphonates*, which was recently

approved by the FDA to treat mineral loss in elderly patients, also appeared to increase bone mineral density. Doctors may choose to selectively prescribe the drug off-label to children to prevent osteopenia.

Pain: Pain can be a problem for people with cerebral palsy due to spastic muscles and the stress and strain on parts of the body that are compensating for muscle abnormalities. Some individuals may also have frequent and irregular muscle spasms that can't be predicted or medicated in advance.

Doctors often prescribe diazepam to reduce the pain associated with muscle spasms, but it's not known exactly how the drug works to interfere with pain signals. The drug gabapentin has been used successfully to decrease the severity and frequency of painful spasms. BT-A injections have also been shown to decrease spasticity and pain, and are commonly given under anesthesia to avoid the pain associated with the injections. Intrathecal baclofen has shown good results in reducing pain, but its delivery is invasive, time intensive, and expensive.

Some children and adults have been able to decrease pain by using noninvasive and drug-free interventions such as distraction, relaxation training, biofeedback, and therapeutic massage. [28]

PROGNOSIS

CP is not a progressive disorder (meaning the brain damage does not worsen), but the symptoms can become more severe over time due to subdural damage. A person with the disorder may improve somewhat during childhood if he or she receives extensive care from specialists, but once bones and musculature become more established, orthopedic surgery may be required. People with CP are more likely to have learning disabilities, although these may be unrelated to IQ, and are more likely to show varying degrees of intellectual disability. Intellectual level among people with CP varies from genius to intellectually impaired, as it does in the general population, and experts have stated that it is important to not underestimate a person with CP's capabilities and to give them every opportunity to learn. Some individuals with CP require personal assistant services for all activities of daily living. Others only need assistance with certain activities, and still others do not require any physical assistance at all. In some cases, people with CP learn to recruit, hire, and manage a staff of Personal Care Assistants (PCAs). PCAs facilitate the independence of their employers by assisting them with their daily personal needs in a way that allows them to maintain control over their lives. Many states allow Medicaid beneficiaries to use their Medicaid funds to hire their own PCAs, instead of forcing them to utilize institutional or managed care.[29]

CONCLUSION

CP is a chronic motor disorder that various efforts failed to prevent its occurrence. In most cases, the cause is unknown and prematurity remains the commonest risk factor. Children with CP suffer from multiple problems and potential disabilities such as mental retardation, epilepsy, feeding difficulties, vision, and hearing impairments. Screening for these conditions should be part of the initial assessment. The child with CP is best cared for with an individualized treatment plan that provides a combination of interventions. This requires the provision of a number of family centered services. Management is not curative; however, if provided optimally it can improve the quality of life of these children and their families. Physicians, in cooperation with the child, family, and members of a multidisciplinary team, can coordinate a complex care system to the maximal benefit of each child.

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