

Rehabilitation of Post Operative Tendon Release Surgery in Lower Limb in Cerebral Palsy Patients

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Abstract: *Cerebral palsy is a leading cause of childhood disabilities in India .3 in every 1000 births are diagnosed with cerebral palsy. The parents may find themselves hopeless and helpless after finding out the prognosis of the condition. Cerebral palsy does not affected the child alone, it affected the whole family and therefore whole family need to participate in the care and rehabilitation of these children .the primary focus of this is creating awareness and guide parents and caretakers of children with cerebral palsy.*

Keywords: White matter, Voxel, Transcutaneous electrical nerve stimulation, Upper motor neuron lesion, Spastic diplegic cerebral palsy, Neonatal intensive care unit, Neuro developmental technique, Sq MRI etc.

1. Introduction

Cerebral palsy is a movement disorder causing inability to perform movement due to lack of muscles strength, muscles co-ordination or excessive tightness of the muscles. The muscle impairments and movement limitation is due to poor development of brain in the womb or damage to the brain tissue because of lack of oxygen or blood at the birth or trauma or infection within 1 year of birth. Cerebral palsy is not progressive meaning the brain damage does not increase over time but it is permanent. It cannot spontaneously heal itself symptom of cerebral palsy can worsen as time lapses because of secondary factor like outgrowth of bones and body in comparison to the muscle development and movement control.

Epidemiology

The most common physical disability in childhood is cerebral palsy (C P). It is difficult to assess and clarify the risk factors associated with this order. Cerebral palsy (CP) is a heterogenous permanent neurological disorder caused by non-progressive damage to the brain control all the functions of over body likes muscles movement, in this disorder injury or system that affects the development of motor function and body posture before during or shortly after birth. The most common form of the cerebral palsy in most of the studies is diplegia which is the most prevent from (30-40%), hemiplegia (20-30%) and quadriplegia (10- 15%).

Geographical

Deformity in cerebral palsy is commonly defined as a result of "muscle imbalance" however studies have shown that while imbalance occurs, it is more important to correct all anatomic levels, the hip, knee, and ankle in conjunction with other specialists. It is now accepted that multilevel surgery should be performed, also known as single event multilevel surgery (SEMLS). Norlin and Tkaczuk described this surgery approach in 1985. SEMLS requires careful surgical planning, a team approach and aggressive rehabilitation to be successful.

Rational

Cerebral palsy (C.P) is frequently associated with joint deformity due to the contracture particularly in the lower limb. These include hip adduction deformity, knee flexion deformity that related to hamstring spasticity and equines deformity of the ankle, lower limb deformity in maintaining hygiene, posture and nursing care. Surgical approach invo; ving soft tissue release and bone surgery are usually effective treatment for contracture.

2. Literature Review

Cerebral Palsy is one of the commonest type of childhood illness worldwide with disabling effect on the quality of life and physical activity and cerebral palsy. Various physiotherapy treatment techniques are in use for treatment of cerebral palsy.

[William Osler sir] A British physician Coined time segment Freud, a neuropathologist in Austria, conducted extensive research and published some of the earliest papers on the subject. But Williom john little an English surgeon was responsible for the foist clinical description and the recognition of the link between low birth weight and perinatal event.

[Dr. Little theorized] that of oxygen demand the sensitive brain tissue which controls movement, Sigmund freud disputed. Dr Littles conditions the pointed out that most cerebral palsy children suffer from additional problems like seizures, mental retardation and visual disturbance. This led him to believe that CP might be caused during the brains development.

[Dr. William john little] publish a paper describing children with spastic diplegiaspasticdiplegia is stl sometime called "little disease" for many years cerebral palsy was treated from a surgical respective that was based upon surgeons experience in treating poliomyelitis. The enthusiasm for surgical intervention to correct deformities to provide stability and to improve motor control decreased as assessment shower that deformities recurred or new ones

development.

[*Winthrop M .Phelps*] began developing a new approach. Phelps becomes aware of the necessity for including exercise, muscles training and bracing in the treatment of CP. Since Phelps area various non surgical have evolved emphasizing neuromuscular training.

[*B. D. Chaurasia's*] A study of cerebral palsy of 1000 cases from India shows the highest percentage of cases with spastic quadriplegia (61%) followed by diplegia (22%). Population based studies from around the world report that the prevalence estimates of CP range from 1.5 to more than 4 per 1000 live birth or children of a defined age range (15-17).

[*Glady Samuel raj*] An overall CP prevalence of 2.1 per 1000 live birth with high prevalence in multiple (7 per 1000 live birth) and in extremely low birth weight <1000g, the prevalence was 50 per 1000 live birth overall the total rate of CP is relatively stable, yet the contribution of prematurity and its complication to the prevalence of this syndrome are steadily increasing due to improvement in obstetric and neonatal care.

3. Research Methodology

Relevant Anatomy and Physiology

Cerebral Palsy (CP) is a motor impairment syndrome resulting for genetic or acquired disorders in the early brain development about 70-90% of cerebral palsy children presented grey and white matter abnormality on the conventional magnetic resonance imaging (MRI) although conventional MRI is valuable in the identification of brain injuries. There are still 10-30% CP patients presenting normal appearance in conventional MRI.

Voxel-based morphometry (VBM) as automated technique are more sensitive than conventional MRI in investigation the structural changes of the whole brain.

Cerebral Cortex

The cerebral cortex develops from the most anterior part, the fore brain region of the neural tube. The brain is the largest and most complex organ in our body. It is composed of billions of neuron that the communicate together by forming numerous connections and synapses.

The brain weight is different between men and women

- Male brain weight about 1336 grams
- Female brain weight about 1198 grams There are three main divisions
- Cerebrum
- Cerebellum
- Brainstem

Basal Ganglia

The basal ganglia consist of a number of subcortical nuclei .the grouping of these nuclei is related to function rather than anatomy. Its components are not part of a single anatomical unit and are spread deep within the brain.

It is part of a basic feedback circuit, receiving information

for several sources including the cerebral cortex. The basal ganglion feeds this information back to the cortex via the refine cortical activity such as that controlling descending motor pathway.

Cerebellum

Cerebellum (Latin small brain) through small in size sub serves important function for maintaining tone, posture and equilibrium of the body. Cerebellum controls the same side of the body directly or indirectly the cerebellum does not initiate movement but it contributes to coordination precision and accurate timing.

The gray matter is highly folded to accommodate millions of neuron in a small area and the arrangement is called "arbor vitae" (vital tree of life).

Tendon

Tendon is the tissue that attaches a muscle to other body parts. Usually bones tendons are the connective tissues that transmit the mechanical force of muscle contraction to the bones the tendon is firmly connected to muscles fibers at one end to components of the bone at its other end .tendon are remarkable strong having one of the highest tensile strength found among soft tissue. Their great strength which is necessary for withstanding the stress generated by muscular contraction is attributed to the hierarchical structure, parallel orientation and tissue composition of tendon fibers.

Risk Factor

- Many causative factors produce CP .infant it is the multiplicity of causative factor that lad denhoff and robinault to refer to cp as a group of cp as a group of diseases.
- The factor common to the group is time of occurrence of the brain dysfunction in the prenatal or natal period .the brain damage that leads to cerebral palsy can be.
- A viral infection during pregnancy such as cytomegalovirus (CMV) or rubella.
- Iso immunization reaction eg.- jaundice due to immunization mechanism related to mixing of fetal Rh positive blood with Rh negative blood.
- Hydrocephalus either before or after birth.

Mode of Mechanism of Injuries

- hePatho - physiology of CP in children born pre- term has been closely linked to neuro-imaging .in the late 1970 and early 1980, cranial ultra ultrasound and computed tomography linked CP to brain hemorrhage and complications.
- In the later 1980 and early 1990, the advent of MRI related that PVL was the major cause of injury.
- Advanced MRI modalities have shown that PVL is often accompanied by diffuse variable injury in cortical, subcortical, and cerebellar gray matter.
- The increased risk of CP in the premature infants is related to complex interrelation between destructive and development mechanism.

Biochemical

- Cerebral palsy (CP) is an umbrella term for non

progressive motor impairment condition secondary to lesion or malformation of the developing brain.

- The condition is also associated with impairments of cognition, sensation and epilepsy, known risk factors for the long life disability span the period prior to conception to 2 years of age.
- They include genetical factor, anomalies, intrauterine growth restriction, infection preterm birth and hypoxia ischemia, as well as events in early childhood such as cerebrovascular accidents.
- Blood test to check for genetic and metabolic abnormalities.

Radiological

- Brain imaging technological can reveal areas of damage or abnormal development in the brain.
- One of these highly accurate normalization techniques is “Large Deformation Diffeomorphic Metric Mapping” (LDDMM). It has only recently been recognized that LDDMM is optimally tailored for brain anatomy.

4. Clinical Manifestation

Sign and symptom can vary greatly movement and condition and co-ordination problem associated with cerebral palsy.

- Variation of muscle tone, such as being either too stiff or too floppy.
- Stiff muscles and exaggerated reflexed (spasticity).
- Stiff muscles with normal reflexes (rigidity).
- Lack of balance and muscle co-ordination (ataxia).
- Tremors or involuntary movement.
- Slow, writhing movements.

Delays in reaching motor skills milestones, such as pushing up on arms, sitting up or crawling.

Differential Diagnosis

Cerebral palsy includes neurodegenerative disorders, inborn errors of metabolism development abnormalities of the spinal cord, neuromuscular disorders, movement disorders, and neoplasm of differential considerations based on the predominant clinical feature.

- Spasticity
- Hereditary spasticity paraplegia
- Tethered cord
- Spinal cord tumour
- Adrenoleukodystrophy
- Arginase deficiency

5. Medical Interventions

BOTOX

- Botox (botulinum toxin type A) has been used as an aid in the treatment of cerebral palsy since the late 1970.
- Botox is injected is very small amount into the muscle to decrease spasticity in patients with cerebral palsy.

Phenol

- Phenol is a chemical that is placed along the never to block nerve impulse before they get to the muscle .it was first used in the 1960 for this purpose.

- The result is decreased contraction and spasticity of the muscle it may also help relieve the pain associated with stretching after botox. Injection and bracing or casting.
- Phenol is used as an acid in the treatment of spasticity in children with cerebral palsy.
- Muscle strength and spasticity return as soon as the nerve regenerates.

Anticholinergics

- Anticholinergics medications are used to treat uncontrolled body movement such as muscle stiffness, tremors and spasms, as well as drooling associated with non spastic cerebral palsy.
- Common uses include treating spastic conditions in the digestive tract, reducing saliva and decreasing bronchial secretion.

Surgical Interventions

- The Achilles tendon is the strongest tendon in the human body. The Achilles tendon is the co joint tendon of the two heads of gastrocnemius and the soleus muscles. Together these structures are often referred to as the “Gastro soleus complex”. It is the largest and strongest tendon in the human body.
- Tendon release surgery, also known as a surgical procedure that involves cutting through or dis connecting a tendon to allow for a greater range of movement.

Physiotherapy Management (PT)

Goal of Physiotherapy in the management of spasticity should include:

- Reduction of excessive tone.
- Facilitate normal moment patterns.
- To give a sense of normal position and normal moments.
- Maintain or improve the person level of functions.

Grade of Voluntarily Control Testing

Grade	Response
0	No contraction
1	Initiation of contraction or flicker of contraction
2	half range of motion in pattern
3	Full range of motion in pattern
4	Initial half range in isolation and later half in pattern
5	Full range of motion in isolation but goes in pattern on giving resistance
6	Full range of motion in isolation and can take resistance like normal

Hyperbaric Oxygen Therapy (HBOT)

Hyperbaric oxygen therapy (HBOT) is the inhalation of 100 % oxygen inside a chamber that is pressurized to greater than 1 atmosphere therefore described as hyperbaric because that pressure is above atmosphere pressure. HBOT is typically administered at 1-3 atmosphere of pressure.

Relevant Complication and its Management

Open surgery for the treatment of Achilles tendon surgery has a wound complication rate of 8- 9 %.

Anesthesia Dolorosa

- The patient complains of distressing number caused by an imbalance in afferent input .it is caused by long term loss of afferent Input and the resultant central nervous

system (CNS) changes.

- A local anesthetic unlock done a few hours prior to the performance of the neurolytic blocks seems to prevent the development of this complication.

Pressure Sores

Certain area in the body is subjected to continuous pressure as the amount of protective tissue between the skin and the bone are lesion tissue absent these areas are heels, malleolus, and head of fibula, sacrum and spine of scapula, greater trochanter, ischia tuberosity, elbow and even the occiput continuous pressure impairs that blood supply to the area hence it become dry and break up causing vibration, and continuous lack of blood supply makes the wound worse and worse without letting it get healed patient, who is commonly immobilized has a tendency to development pressure sores.

Systemic Complication

These include hypertension secondary to sympathetic block and systemic tonic reaction, heart rate, and rhythm disturbance, blood pressure changes and central nervous system (CNS) excitation and depression.

Urinary Tract Infection

These are growth of bacteria primary due to the pressure of including complication which act as a main source of enhance for the bacteria.

Psychological Disturbances

It includes the method disturbance as well as the anxiety.

6. Discussion

Cerebral palsy is the result of a non progressive lesion occurring in the developing brain which result in fixed postural and the motor impairment .the lesion in the brain causes problem related to muscle tone and the coordination which with time usually results in secondary joint Contracture due to the power imbalance in the musculoskeletal system. Single event multilevel surgery (SEMLS) refers to the correction of the secondary musculoskeletal problem and gross motor function classification system level II and level III , cerebral palsy is the frequently associated with join deformities due to contractures particularly in the lower limb.

7. Conclusion

A number of surgical methods have been described for soft tissue release, and tendon release surgery varying from aponeurotic lengthening to Z- lengthening to tenotomy.

Achilles tendon release (ATR) is a surgical procedure that aims to stretch the Achilles tendon to allow a person to walk flatfoot without a bend in the knee, or to bring relief to chronic pain. This procedure elongated a contracted Achilles tendon by making small cut on the tendons at the back of the ankle, as the wound heal the tendon elongated.

Selective dorsal rhizotomy (SDR) is an aggressive procedure that helps reduce pain and spasticity. It is the only surgery that permanently reduces spasticity.

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