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Neurosensorimotor Reflex Integration, Myofascial Release, & Neuro-Developmental Treatment In Children With Cerebral Palsy Athetoid Diplegi: Case Report

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Abstract. Cerebral Palsy (CP) is a disorder caused by brain damage that results in impaired motor and intelligence function. The causes of CP can be divided into three parts: prenatal, natal, and postnatal. The causes of the Prenatal period are maternal infections, hypoxia or ischemia, and placental abnormalities. The causes of the Christmas period are Birth Trauma, Birth Asphyxia, and premature birth. The causes of the postnatal period are neonatal infections, head trauma, and ongoing medical conditions. Measurements were carried out by palpating muscle tone and primitive reflexes with blank gross motor ability reflexes of children with GMFM. The therapy administration for 4 times has not significantly affected muscle tone with muscle palpation at T1, T2, T3, T4 with hypertonic results. Pathological primitive reflexes with reflex blanks on T1, T2, T3, T4 with positive results of ATNR, Cross extensors, graps, Neck righting, Body righting, Optical righting, Labiryn Righting. Gross motor ability with GMFM at T1, T2, T3, T4 with a yield of 34.4%

Keywords: Cerebral Palsy, Neurosensorimoror Reflex Integration, Myofascial release, Neuro-Developmental Treatment

INTRODUCTION

Cerebral Palsy (CP) is a disorder caused by brain damage that results in impaired motor and intelligence function. Uncontrolled and slow writing movements characterize athetoid cerebral palsy. This abnormal movement hits the hands, feet, arms, or legs, mostly on the muscles of the face and tongue, causing the child to salivate.

The causes of CP can be divided into 3 parts: prenatal, natal, and post-natal. Prenatal Causes Infections occur during pregnancy, causing abnormalities in the fetus such as lues, toxoplasmosis, rubella, and cytomegalic inclusion disease. Abnormalities that appear usually retardation movements, mental disorders, anocitations in the womb, exposure to X-ray radiation, and pregnancy poisoning can cause cerebral palsy. Christmas is anoxia/hypoxia; the most common cause found in the perinatal period is a brain injury. This situation causes anoxia. This is found in abnormal baby presentation states, cephalopelvic disproportion, old parts, placenta previa, placental infection, parts using the help of certain instruments, and being born with a cesarean section; brain hemorrhage can subarachnoid occur in the space will cause blockage of cerebrospinal fluid (CSS) resulting in hydrocephalus. Bleeding in

the subdural space can compress the cerebral cortex so that spastic paralysis occurs. Prematurity of premature babies is more likely to suffer from brain hemorrhage than normal babies because blood vessels, enzymes, and blood clotting factors are still imperfect. Jaundice, in the neonatal period, can cause permanent damage to brain tissue due to the entry of bilirubin into the basal ganglia, for example, in blood type incompatibility disorders. Purulent meningitis in infancy, if treated late or inappropriately, will result in sequelae in the form of cerebral palsy. Postnatal is any damage to brain tissue that interferes with development and can cause cerebral palsy, for example, trauma capitis, meningitis, encephalitis, and postoperative brain scarring.

The role of physiotherapy in cerebral palsy is determined by the condition whose problem is identified based on the results of physiotherapy studies, which include assessment, diagnosis, planning, intervention, and evaluation. Physiotherapy interventions are promotive, preventive, rehabilitative, curative, and maintenance with physiotherapy modalities.

CLINICAL PROBLEMS

Various kinds of clinical problems arise in patients with *Cerebral Palsy Athetoid Diplegi*. Physiotherapy problems found include increased muscle tone, primitive reflexes that become pathological such as ATNR; Babinski; and grasp reflex, there are sensory disorders, delays in gross motor ability and functional ability, and there is spastic in the ankle and wrist region,

METHOD

The methodology used in this study is a case study; the case discussed is the condition of patients with Cerebral Palsy, Diplegia, and Athetoid who currently cannot walk independently. This results in children being unable to carry out their daily activities independently and still needing the help of others, which will be explained in the case resume section and clinical problems percutaneously.

DISCUSSION

The child is named An. B (initials), aged 13 years old, was medically diagnosed with Cerebral Palsy Diplegia Athetoid. The results of the anamnesis to the patient's mother (Hetero), during pregnancy, the mother had consumed the vitamins recommended by the doctor and consumed nutritious foods, the mother gave birth normally, and the child was taken home; after five days, the child had a high fever, and the child's body was yellow, then taken to the hospital and admitted to the ICU for one week. The doctor said that the child had an excess of bilirubin, so the child was exposed to jaundice. The patient's mother noticed the strangeness in the child at the age of 3 months; the child has not been able to make any movements, only open and close the eyes. Then, the mother took her child to the posyandu, and the posyandu officer advised her child to be taken to physiotherapy. After that, the child was diagnosed with Cerebral Palsy. At the age of 3 years, children are not yet able to roll over, sit, and walk; parents still assist with all functional activities, and they eat with mashed food. In the family

history, there is no family history of experiencing Cerebral Palsy by both mother and father; when the child is born, the child immediately cries, and the child's weight is 2.9 kg.

The examinations carried out were palpation for muscle tone (Table 1), primitive reflexes with reflex blanks (Table 2), sensory using sensory blanks (Table 3), gross motor ability with *Gross Motor Function Measurement* (GMFM) (Table 4), functional capabilities using GMFCS, MACS, CFCS, EDACS, and VFCS (Table 5), spasticity using the Ashworth scale (Table 6).

Table 1. Muscle tone

Muscle	Muscle Tone (T1)
Anterior tibialis	Hypertonus
gastrocnemius	Hypertonus

Table 2. Primitive reflexes

Level	Reflexes	Results (T1)
Spinal	Moro	- (integrated)
	Flexor with drawl	- (integrated)
	Trust extensors	- (integrated)
	Cross extensor	+ (pathological)
	grasp	+ (functional)
Brain stem	ATNR	+ (pathological)
	Supporting reaction	- (integrated)
	Tonic labyrinthine	- (integrated)
Mid brain	Neck righting	+ (pathological)
	Body righting	+ (pathological)
	Optical righting	+ (pathological)
	Labiryn Righting	+ (pathological)
Cortical	Prone	+ (functional)
	Supine	+ (functional)
	Sitting	+ (functional)
	Standing	- (pathological)

Table 3. Sensory

Sensory	Score (T1)
Visual	2
Smell	1
Auditory	2
Taste	1
Anonymous	1
Touch	1
Vestibular	0
Propiceptive	0

Table 4. Gross Motor Ability

Dimension	Results (T1)
Lying & rolling	67%
Sitting	72%
Crawling & kneeling	33%
Standing	0%
Walking, running, jumping	0%
Total	34, 4%

Table 5. Functional Capabilities

Dimension	Results (T1)
GMFCS	4
MACS	3
CFCS	3
EDACS	3
VFCS	1

Table 6. Dextra side spasticity

Muscle groups	Dextra (T1)
Elbow flexor	2
Elbow extensor	2
Pronator elbow	2
Wrist flexor	2
Wrist extension	3
Hip extensors	1+
Hip endo rotator	1+
Hip Abduction	2
Hip adduction	2
Knee flexors	1+
Knee extensor	2
Dorsal ankle flexors	2
Plantar Ankle Flexor	2

The interventions used to overcome the disorder in the child were NSMRI, *Myofascial release*, and NDT.

Neurosensorimotor Reflex Integration

The management of NSMRI is carried out to encourage the development of children's motorists. NSMRI aims to develop and restore children's neurological function and improve sensory information processing. The NSMRI technique is carried out on CP children swabbing all over the body: smooth stars, wave stars, eight stars, *stretch* stars, and *contract stars*. The movement is carried out three times clockwise, starting from the middle of the body (*umbilicus*) to the left and right pelvis.

Myofascial release

Myofascial release Is a method to facilitate the adaptive potential of mechanical, nervous, and psychological systems interconnected through *myofascial networks* (Muna et al., 2023). This technique

refers to manual massage to stretch the fascia and release the adhesion of the bonds between the fascia and the skin, muscles, and bones, t f relieve pain, increase the range of motion of the joints, improve the balance of the body, and restore functional movement functionally (Ariani & Widodo, 2022).

The technique uses the entire surface of both thumbs attached to the area to be intervened in. The pressure is gentle and constant; three repetitions of each myofascial point require attention.

Neuro-Developmental Treatment

NDT is a physical therapy that reduces abnormal tone, reflexes, and posture, an inhibition-based intervention (Park, 2016). The inhibition technique in NDT can lower muscle tone and inhibit abnormal movement patterns that interfere with passive and active movements, restoring the morphal movement patterns of the torso and extremities by stretching the muscles that are experiencing spastics.

Table 7. Muscle tone

Muscle	Muscle Tone (T4)
Anterior tibialis	Hypertonus
gastrocnemius	Hypertonus

Table 8. Primitive reflexes

Level	Reflexes	Results (T4)
Spinal	Moro	- (Integrated)
	Flexor with drawl	- (Integrated)
	Trust extensors	- (Integrated)
	Cross extensor	+ (pathological)
	grasp	+ (functional)
Brain stem	ATNR	+ (pathological)
	Supporting reaction	- (Integrated)
	Tonic labyrinthine	- (Integrated)
Midbrain	Neck righting	+ (pathological)
	Body righting	+ (pathological)
	Optical righting	+ (pathological)
	Labiryn Righting	+ (pathological)
Cortical	Prone	+ (functional)
	Supine	+ (functional)
	Sitting	+ (functional)
	Standing	- (pathological)

In NDT, facilitation aims to facilitate normal motor movements in normal muscle tone, provide a sensation of normal movement on the disturbed side, and stimulate muscles directly to contract isometrically, eccentrically, or isotonically. This technique is called the *key point of control.* Kind *Key Point of Control* divided into 3.

1. CKP (*central key point)*

   It is located in the posterior processes xyphoideus (T7-T8).

2. PKP (*proximal key point*)

Located on the head, shoulders, and pelvic.

3. DKP (*distal key point*)

   It is located on the hands and feet.

Table 9. Sensory

Sensory	Score (T4)
Visual	2
Smell	1
Auditory	2
Taste	1
Anonymous	1
Touch	1
Vestibular	0
Propiceptive	0

Table 10. Gross Motor Ability

Dimension	Results (T4)
Lying & rolling	70%
Sitting	75%
Crawling & kneeling	38%
Standing	0%
Walking, running, jumping	0%
Total	36, 6%

Table 11. Functional Capabilities

Dimension	Results (T4)
GMFCS	4
MACS	3
CFCS	3
EDACS	3
VFCS	1

Table 12. Dextra side spasticity

Muscle groups	Dextra (T4)
Elbow flexor	2
Elbow extensor	2
Pronator elbow	2
Wrist flexor	2
Wrist extensioner	2
Hip extensors	1+
Hip endorotator	1+
Hip Abduction	2
Hip adduction	2
Knee flexors	1+
Knee extensor	2
Dorsal ankle flexors	2
Plantar Ankle Flexor	2

Cerebral Palsy (CP) is a disorder caused by brain damage that results in impaired motor and intelligence function. The causes of CP can be divided into three parts: prenatal, natal, and postnatal. The causes of the Prenatal period are maternal infections, hypoxia or ischemia, and placental abnormalities. The causes of the Christmas period are Birth Trauma, Birth Asphyxia, and premature birth. The causes of the postnatal period are Neonatal Infections, Head Trauma, and Ongoing Medical Conditions.

The patient was given four therapy times: neurosensory motor integration reflex, myofascial release, and neurodevelopmental treatment. Before being given physiotherapy interventions, children are measured first, such as muscle tone with palpation, pathological children's primitive reflexes with primitive blanks, and children's gross motor skills with GMFM. After an examination, the child was given therapy. During therapy, the child must always be evaluated to the limit of the child's ability. The first intervention given was neurosensory motor integration reflexes for 15 minutes. Then, myofascial release is administered from the upper extremity to the lower extremity for 15 minutes. Then, the administration of neurodevelopmental treatment was continued for a maximum of approximately 1 hour. After giving neuro-sensory motor integration reflexes, the child's myofascial release and NDT are re-measured to evaluate the child's final ability. After four therapy sessions, there has been no change in muscle tone, pathological primitive reflexes, or gross motor skills in children.

CONCLUSION

The combination of Neurosensory Motor Reflex Integration, Myofascial release, and Neuro-Developmental Treatment can provide synergistic benefits in the therapy of CP athetoid diplegia. Neurosensory Motor Reflex Integration (NSRI) helps integrate uncoordinated reflexes, Myofascial release (MFR) helps overcome excessive tissue tension, and Neuro-Developmental Treatment (NDT) helps facilitate better motor development.

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