

Physiotherapy Management in Spina Bifida Cases

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ABSTRACT

Spina bifida or *neural tube defect* (NTD) is a spinal disorder that does not close completely, resulting in disability or developmental failure of the spinal cord. The cause of spina bifida has no definite reason, but there are several factors that are considered to increase the risk, namely folic acid deficiency, family history of spina bifida, and history of taking drugs. Patients with spina bifida will experience weakness in the lower extremity muscles, decreased ability to control urination, and decreased ability to carry out daily activities. The study used a case report study conducted at YPAC Surakarta for boys aged 15 years with spina bifida disorder. Physiotherapy plays a role in optimizing muscle strength, active movement of children, and improving functional abilities by using interventional *stretching exercises*, *myofascial release*, *strengthening exercises*, and a combination of *Kegel Exercises* and *bridging exercises*. After being treated for 6 times T1-T6 there was an increase in muscle strength as measured by manual muscle testing (MMT), changes in the range of motion of the joints (LGS) as measured by the goniometer, an increase in functional ability as measured by the *Barthel Index*.

Keywords: *Spina Bifida, Physiotherapy, MMT, LGS, Index Barthel*

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INTRODUCTION

Neural tube defect (NTD) is a congenital disorder that occurs as a result of failure to close the neural plate which occurs in the third to fourth week of gestation. Abnormalities that occur in neural tube defects usually affect the meninges, vertebrae, muscles, and skin. Differences included in NTD include *anencephaly*, *encephalocele*, *meningocelecranial*, *myelomeningocele*, *spinal meningocele*, *lipomeningocele*, spina bifida, and other brain defects (Wulan & Simanjuntak, 2016).

Spina bifida or *neural tube defect* (NTD) is a congenital abnormality or birth defect that

occurs in the spine and brain, generally occurs in newborns around the world. In Indonesia, the most common congenital abnormalities found are from the nervous system group (anencephali, spina bifida and meningochele) 22%, musculoskeletal (talipes) 22.3%, omphalocele 12.5% and cleft lip and palate 18.5 % . In 2016 the number of children with spina bifida is around 8:1,000 of the birth rate (Sahmat et al., 2017). Based on survey data from the Indonesian Ministry of Health in 13 hospitals from various provinces in Indonesia in 2014, spina bifida was reported as one of the most common congenital neurological disorders found in infants. A study conducted at RSUPN Dr. Cipto Mangunkusumo showed that spina bifida occurs in 33.33% of

babies born with birth defects. The prevalence in the female sex dominates sufferers with congenital defects and the majority have a birth weight of less than 2500 grams.

Recent studies suggest an incidence of approximately 3.63 per 10,000 live births in the United States and an incidence of 18.6 per 10,000 worldwide. In addition, although the mortality rate has fallen to approximately 8% for live births with spina bifida, it is still 10 times higher than the national average for all live births in the United States. Victims experience reduced mobility, bowel and bladder dysfunction, and neurological sequelae (Hassan *et al.*, 2022). At the Surakarta Disabled Children Education Foundation (YPAC) there is one child who has spina bifida which was acquired from birth because during pregnancy the mother lacked nutrients such as folic acid.

There is no definite reason for spina bifida, but there are three possible causes for abnormal closure of the neural tube. First, if there is abnormality in the hydroluronic acid matrix or actin microfilaments the neural tube will not be able to close. Second, if overgrowth occurs at the sacral end the neural tube will not close, but will close during the growth process. Third, the last chance for the tube not to close properly occurs when the glycoproteins that normally hold osteoblasts together during closure fail to attach. In addition there are environmental and tissue factors such as maternal nutrition and genetics. This condition can be classified from mild to severe, depending on its severity, location, size, and possible complications. Mild spina bifida may not have too much effect on growth and development disorders so that children can go through their growth and development properly. However, in severe cases, children can become disabled for life (Naufal, 2019).

Spina bifida or *neural tube defect* (NTD) has four classifications, namely: occulta or lipomenigocele, closed neural tube defects (CNTD) lipomyelomeningocele, meningocele, and myelomeningocele. Spina bifida myelomeningocel or meningocele is very common in the lumbosacral region. Based on the severity of spina bifida and involvement of the

peripheral nerves and spinal cord, weakness in the lower extremities, hip dislocation, impaired urination and defecation, and fluid accumulation in the brain (hydrocephalus) can occur (Attuzaqiyah, 2017). Thus, children with spina bifida have limitations in carrying out daily activities due to loss of motor functions, such as standing, walking, and bladder and bowel control functions, as well as impaired sensation. This will immobilize the lower extremities, where immobilization can stimulate muscle atrophy, reduce muscle strength and limit movement in the extremities lower.

Physiotherapy plays a very important role in spina bida because physiotherapy is a form of health service aimed at individuals and or groups to develop, maintain and restore body movement and function throughout the life cycle using manual handling, increased movement, equipment (physical, electrotherapeutic and mechanical), function training, and communication (Saputra & Indrani, 2017). In this case study the researcher used physiotherapy interventions in the form of Stretching exercises, Myofacial release, Strengthening exercises, Combination of Kegel Exercise and bridging exercises. Measuring tools used are muscle strength with MMT, range of motion with a goniometer, and functional ability with the Barthel index.

RESEARCH METHODS

The research method used a case report study conducted at YPAC Surakarta on An. ARP aged 15 years with a medical diagnosis of Spina Bifida. The patient has undergone therapy 6 times by providing physiotherapy interventions Stretching exercise, Myofacial release, Strengthening exercise, Combination of Kegel Exercise and bridging exercise. The above interventions in the form of stretching exercises can increase body flexibility and reduce the risk of difficulty moving, myofacial release aims to stretch fascia, reduce tissue adhesions and repair soft tissue structures, strengthening exercises strengthening exercises with weights to increase muscle strength, a combination of Kegel Exercise and bridging exercises aims to

increasing pelvic floor muscle strength in spina bifida patients with urinary incontinence.

RESULTS

In this study provided 4 physiotherapy interventions to patients for 1 month with a total of 6 meetings. The provision of this intervention aims to optimize the patient's ability to perform active movements. After the administration of physiotherapy interventions, evaluation of muscle strength, range of motion, and functional abilities was carried out using the Barthel Index.

Sendi	Sinistra	
	T1	T6
Hip	S : 5°-110° F : 40°-10°	S : 5°-115° F : 40°-15°
Knee	S : 5°-110°	S : 5°-120°
Ankle	-	-

Table 1. Evaluation of Muscle Strength

Grup otot	Dextra		Sinistra	
	T1	T6	T1	T6
Fleksor hip	4	4	3	4
Ekstensor hip	3	3	3	3
Abduktor hip	3	4	3	3
Adduktor hip	3	3	3	3
Fleksor knee	4	4	3	4
Ekstensor knee	2	3	2	3
Dorso fleksor	0	0	0	0
Plantar fleksor	0	0	0	0
Inversi	0	0	0	0
Eversi	0	0	0	0

Table 2. Evaluation of LGS Dextra

Sendi	Dextra	
	T1	T6
Hip	S : 5°-120° F : 40°-15°	S : 5°-125° F : 45°-15°
Knee	S : 5°-120°	S : 5°-125°
Ankle	-	-

Table 3. Evaluation of LGS Sinistra

Table 4. Evaluation of Functional Examination Ability

No	Ability	T1	T6
1	Eat	10	10
2	Bathe	5	5
3	Appearance	5	5
4	Dress	5	5
5	Defecate	5	5
6	Urination	0	0
7	Toilet use	10	10
8	Change places	15	15
9	Mobility	15	15
10	Climb/descend stairs	0	0
Total		70	70
		moderat	moderat

DISCUSSION

Underlying Process Spina Bifida

Deficiency of folic acid and genetic factors cause embryonic development to be disrupted resulting in failure of the closing of the nerve elements and spinal canal and a protrusion of the meninges and spinal cord which is called spina bifida occurs. Spina bifida consists of several classifications, namely, occulta or lipomenigocele, closed *neural tube defects* (CNTD) lipomyelomeningocele, meningocele, and myelomeningocele. In spina bifida, it will cause a decrease in lower extremity muscle strength, decrease in the range of motion of the joints (LGS), and decrease in functional ability. The physiotherapy interventions provided were in the form of *stretching exercises, myofacial release, strengthening exercises*, a combination of *Kegel exercises* and *bridging exercises*. (Attached)

Evaluation of Muscle Strength with MMT

Evaluation of muscle strength measurements using MMT is as shown in Table 1, after the administration of T1-T6 physiotherapy interventions, it was found that patients diagnosed with spina bifida using strengthening exercises indicated a slight increase in several muscle groups such as the left hip flexor muscle group, dextra hip abductors, and left hip flexors. left knee, and left dextra knee extensor also increased. This is in line with previous studies which explained that spina bifida will affect the structure of the spinal cord, which can result in muscle weakness, paraplegia, bone deformities, loss of sensation, impaired coordination, impaired balance, reduced mobility and functional activity (Silva *et al.* , 2021).

Evaluation of LGS Examination With a Goniometer

Evaluation of LGS measurements using a Goniometer as shown in Table 2, after the administration of physiotherapy interventions, the results were obtained after 6 treatments, patients diagnosed with spina bifida using stretching exercises, strengthening and

myofacial release indicated a slight increase in the range of motion in several joints as in hip and knee experience an increase in LGS after therapy, this is in line with previous studies because spina bifida patients have limited use of the lower extremities, exercises must depend on the upper extremities and trunk (Mokhena *et al.*, 2020).

Evaluation of Functional Capability with the Barthel Index

Evaluation of functional ability with the Barthel Index as shown in Table 3, after the administration of physiotherapy interventions, the results obtained from T1-T6 patients with postoperative spina bifida still experience moderate or moderate dependence with a value of 70 out of 100 functional activity. This is in line with previous research that increased functional ability in patients increases due to the reciprocity of the muscle strength itself and the body's ability to receive stimuli from outside the body (Mohamed *et al.*, 2020).

INTERVENTION TECHNOLOGY

Stretching Exercises

Stretching exercise is an activity to stretch muscles, increase muscle flexibility and range of motion in joints. Stretching is very effective in increasing the flexibility of muscles and joints so that it can have the effect of reducing or eliminating joint pain (Monayo & Akuba, 2019). One of the stretching exercises that is useful for increasing flexibility and preventing injury is static stretching exercise. Static stretching exercise is stretching one or several muscle groups by moving the body position and then maintaining that position for a predetermined amount of time. Static stretching techniques are often included in the warm-up component before doing exercises to increase the range of motion (ROM) of a joint, which is beneficial in increasing flexibility. The movement is repeated 3 times per session with a pause of 10 seconds for each repetition. This exercise is carried out 3

times a week, for 4 weeks so that the total exercise given is 12 times (Yudiansyah, 2022).

Myofacial Release

Myofascial release is a manual massage technique aimed at stretching fascia, reducing tissue adhesions and repairing soft tissue structures so that pain can be reduced and restore normal functional movement. Procedure: the patient is in a lying position on the bed, then the therapist performs a myofascial release on the muscle that is experiencing spasm in the upper trapezius and quadriceps muscles. Myofascial release is carried out 90-120 seconds repeated 5 times a week for 1 week to release trigger points and reduce muscle spasms so as to reduce pain levels and restore normal muscle function (Sulistyaningsih & Putri, 2020).

The frictional movement of the myofascial release given according to the direction of the muscle fibers is effective in eliminating trigger points, allowing the muscle fibers to move more normally, increasing blood flow through the tissues and decreasing nerve and muscle sensitivity (Kaprail *et al.*, 2019).

Strengthening Exercise

Strengthening exercise is a physiotherapy treatment technique that can reduce and improve physical disorders including increasing the Range of Motion, muscle strength, cardiopulmonary balancing and Activity Daily Living. This is in line because strengthening exercises can increase muscle strength which results in morphological changes in the muscles being trained, increasing muscle mass and producing many mitochondria (Fau Deo Yohanes *et al.*, 2022).

Participants will do lower leg muscle strengthening exercises such as knee flexors and extensors as well as hip adductors and abductors. Exercises will be performed with repetition to enhance motor learning and increase strength and endurance (Silva *et al.*, 2021).

1. Exercise from sitting to standing is done as much as 2 sets of 5 repetitions.

2. Exercise standing with assistance or without assistance, maintain the position for 5 minutes and then rest.

3. Exercise standing on one leg with the help of a table for grip, done as much as 1 set of 5 reps for 10 seconds.

4. Forward gait exercises, namely being instructed to walk in parallel bars, do 5 reps.

Vidhi *et al.* (2018), there was a significant change in gross motor skills after 6 weeks of strengthening exercises.

Combination of Kegel Exercise and Bridging Exercise

Kegel Exercise and bridging exercise are both strengthening exercises. When doing a combination of Kegel Exercise and bridging exercise, what happens is not only muscle strengthening but also flexibility. This exercise aims to increase the strength of the pelvic floor muscles. When doing a combination of Kegel Exercise and bridging exercise, what happens is neurological adaptation and structural adaptation. Neurological adaptation occurs by activating the motor units that innervate the nerves. Structural adaptation related to muscle hypertrophy or increase in muscle size. Thus that when the intra-abdominal muscle strength is strong, the pressure will not be fully transmitted to the urinary tract. the first step, the patient is in a supine sleeping position on the bed then both legs are bent and both hands are by the side of the body. Then do the movement of tightening the abdominal muscles and lifting the hips until they are in a straight line with the knees and shoulders, then combine it by contracting the pelvic muscles in the same way when we hold urine again up to 10-15 times per session for 5-10 seconds (Rijal *et al.*, 2019).

CONCLUSION

Research has been conducted on patients with a diagnosis of Spina Bifida for 6 times of therapy by providing physiotherapy interventions in the form of Stretching exercises, Myofacial release, Strengthening exercises, and a combination of Kegel Exercise and bridging exercises. showed significant development results. The results show an increase and change in muscle strength, LGS, and functional ability.

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LAMPIRAN UNDERLYING PROCESS



