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Case Report

Case Report : Rehabilitation Intervention in Improving Infant's Oromotor Skill and Body Weight

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Abstract

Background : Preterm birth rates are still very high. Global data found that preterm babies occurred in 11% of all live births. A recent study showed that more than 25% of neonates baby born between 28 and 32 weeks of gestation, developed disorders condition at the age of two, and this ratio reached 40% at the age of ten. Preterm infants had higher risk of poor motoric skills, such as subtle deficits in eye-hand coordination, sensory-motor integration, manual dexterity, and gross motor skills that lead to poor feeding skills and neuromotor development delay. Therefore, interventions need to be done to optimize growth and development.
Case : A 10-day-old male infant consulted by the Medical Rehabilitation department due to feeding difficulty and low birth weight. At 10 days old, the patient weighs 1550 grams, length 44 cm, head circumference 31 cm, and the non-nutritive scoring (NNS) was 45. The patient was given proper positioning, oral motor stimulation (OMS) with the Fucile method for 1 week in the hospital and the treatment continue at home. After 2 weeks of intervention, the infant's body weight increased to 2010 grams, body length 45 cm, head circumference 32 cm, and the non-nutritive scoring (NNS) became 86.
Conclusion : Oral motor stimulation improves oral motor skills such as sucking and swallowing reflexes in infants without organ abnormalities thus optimized good oral feeding ability and weight gain acceleration.

Keywords : oral motor stimulation, body weight, oromotor skill, premature, infant

INTRODUCTION

Preterm infant birth is a condition of childbirth in less than 37 weeks gestation, with a baby weighed less than 2500 grams.[1] Based on the weight of the fetus at birth, preterm infants are divided into *low birth weight* (birth weight <2500 grams), *very low birth weight* (birth weight <1500 grams), and *extremely low birth weight (birth weight* <1000 grams).[2] Platt *et al*. (2014) highlighted that preterm birth is a common issue worldwide, estimated at 10% from all of births. Preterm infants are more prone to face short-term and long-term neurodevelopmental disorders due to intrauterine growth interruption and hospitalization in the neonatal intensive care unit (NICU).[3] A recent study showed that more than 25% of neonates, born between 28 and 32 weeks of gestation, developed disorders condition at the age of 2, and this ratio reached 40% at the age of 10.[4] Therefor infants without major neurodevelopmental delays are still have higher risk of poor motor outcomes, such as subtle deficits in eye-hand coordination, sensory-motor integration, manual dexterity, and poor motor skills.[5] One of the problems of preterm baby is eating difficulties due to anatomical disorders in mouth area, impaired sucking patterns, and impaired sucking-swallowing-breathing coordination. Early detection and medical rehabilitation are needed to overcome the disorder experienced by preterm infants. Sucking reflex disorder if not properly managed can lead to impaired growth and development. Therefor OMS should be performed for 2 weeks and evaluated through weight gain and *non-nutritive scoring* (NNS) to asses oral motor skills before and after the intervention. Currently, there are only few scientific evidences related to medical rehabilitation in preterm infant, so this report was created to have outcomes of medical rehabilitation in preterm infant with low birth weight.

CASE PRESENTATION

Newborn baby, on May 28, 2024, male, was born from P2A0 mother, 34 weeks gestation, by section cesarean on the indication of *impending eclampsia*. The baby was born with no immediate cry, and retraction was found. The baby's Apgar scores at 1, 5, and 10 minutes were 5, 6, and 7, respectively. The anthropometric status of the baby followed as: body weight in 1820 grams, body length in 44 cm, and head circumference in 31 cm. The baby was resuscitated and received oxygen therapy through *continuous positive airway pressure* (CPAP) with a PEEP setting of 7 cmH_2O and an oxygen fraction of 35%. On the seventh day, oxygen therapy through CPAP was stopped.

On the tenth day, the infant transferred to the

TABLE 1
NNS score before medical rehabilitation intervention in infants

Positive Items	Mark the suitable				Converted Values
Rooting reaction	Yes ( ) (4)	No (✓) (0)			0
Easy beginning of sucking	Yes ( ) (4)	No (✓) (0)			0
Labial sealing	Always ( ) (12)	most part (✓) (8)	sometimes ( ) (4)	never ( ) (0)	8
Tongue central groove	Always ( ) (9)	most part ( ) (6)	sometimes (✓) (3)	never ( ) (0)	3
Peristatic tongue movement	Always ( ) (9)	most part ( ) (6)	sometimes (✓) (3)	never ( ) (0)	3
Jaw raising and lowering movement	Always ( ) (9)	most part (✓) (6)	sometimes ( ) (3)	never ( ) (0)	6
Labial, tongue and jaw coordination	Always ( ) (15)	most part (✓) (10)	sometimes ( ) (5)	never ( ) (0)	10
Sucking strength	Always ( ) (12)	most part (✓) (8)	sometimes ( ) (4)	never ( ) (0)	8
Sucking rhythm	Always ( ) (12)	most part (✓) (8)	sometimes ( ) (4)	never ( ) (0)	8
Total positive items					

TABLE 1. *Continued...*

Negative Items	Mark the suitable				Converted Values
Bites	Always ( ) (-3)	most part ( ) (-2)	sometimes (✓) (-1)	never ( ) (0)	-1
Excessive jaw excursion	Always ( ) (-3)	most part ( ) (-2)	sometimes ( ) (-1)	never (✓) (0)	0
Stress signals	Always ( ) (-15)	most part ( ) (-10)	sometimes ( ) (-5)	never (✓) (0)	0
Total negative items					-1
TOTAL					45

TABLE 2
NNS score after medical rehabilitation intervention in infants

Positive Items	Mark the suitable				Converted Values
Rooting reaction	Yes (✓) (4)		No ( ) (0)		4
Easy beginning of sucking	Yes (✓) (4)		No ( ) (0)		4
Labial sealing	Always (✓) (12)	most part ( ) (8)	sometimes ( ) (4)	never ( ) (0)	12
Tongue central groove	Always (✓) (9)	most part ( ) (6)	sometimes ( ) (3)	never ( ) (0)	9
Peristatic tongue movement	Always (✓) (9)	most part ( ) (6)	sometimes ( ) (3)	never ( ) (0)	9
Jaw raising and lowering movement	Always (✓) (9)	most part ( ) (6)	sometimes ( ) (3)	never ( ) (0)	9
Labial, tongue and jaw coordination	Always (✓) (15)	most part ( ) (10)	sometimes ( ) (5)	never ( ) (0)	15
Sucking strength	Always (✓) (12)	most part ( ) (8)	sometimes ( ) (4)	never ( ) (0)	12
Sucking rhythm	Always (✓) (12)	most part ( ) (8)	sometimes ( ) (4)	never ( ) (0)	12
Total positive items					86
Negative Items	**Mark the suitable**				**Converted Values**
Bites	Always ( ) (-3)	most part ( ) (-2)	sometimes ( ) (-1)	never (✓) (0)	0
Excessive jaw excursion	Always ( ) (-3)	most part ( ) (-2)	sometimes ( ) (-1)	never (✓) (0)	0
Stress signals	Always ( ) (-15)	most part ( ) (-10)	sometimes ( ) (-5)	never (✓) (0)	0
Total negative items					0
TOTAL					86

Medical Rehabilitation department due to a lack of suction reflex, with status of the baby followed as: ten days old with a body weight of 1550 grams and a body length of 44 cm. Based on physical examination laboratory and x-ray, no abnormalities were found in the oromotor organ, lungs, and heart. Then, the baby was given medical rehabilitation interventions, such as oral motor stimulation four times a day for 10 minutes, tactile stimulation, proprioception, and vestibular stimulation once a day for 4 minutes, and *positioning* using swaddling with *midline* flexion and *nesting* positions during care. The intervention occurs for two weeks, with one week treatment at the hospital by a doctor and one week treatment at home by the parent. The intervention was monitored through communication via telephone and home visits. At post-intervention control, the baby was 24 days old, weighed 2010 grams, body length 45 cm, and head circumference 32 cm. In addition to anthropometric evaluation, patients were evaluated using the *non-nutritive scoring* (NNS) *system* to assess the ability of sucking in preterm infants before oral feeding. The NNS score was calculated before and after the medical rehabilitation intervention, as shown in Table 1.

DISCUSSION

In this case report, a baby was born from P2A0 mother, 36 weeks gestational age, by *section caesarian* on the indication of *impending* eclampsia. The baby was born with a body weight of 1820 grams, a body length of 44 cm, and a head circumference of 31 cm. Based on these two data, the preterm baby born in less than 37 weeks gestation, with the baby weighed less than 2500 grams.[1] Based on the weight of the fetus at birth, the baby is classified as low birth weight baby (LBW) or *low birth weight* because the baby's birth weighed between 1500 grams to 2500 grams.[2]

The baby in this case had respiratory distress at birth and an inadequate suction reflex. The infant was given oxygen therapy via *continuous positive airway pressure* (CPAP) with a PEEP setting of 7 cmH_2O and an oxygen fraction of 35%. On the seventh day, oxygen therapy through CPAP was stopped. Meanwhile, to improve the suction reflex, the infant was transferred to medical rehabilitation for further treatment Preterm babies experienced various disorders due to the immature development of the baby in the womb, but the baby has already been born due to multiple conditions. Babies born at 32–36 weeks gestation, as in this case, have an 8% risk of developmental disorders, such as neurosensory disorders, cognitive and language development disorders, motor disorders, neurobehavioral, socioemotional, and learning difficulties.[7]

Medical rehabilitation interventions are needed to optimize child development, catch up with developmental delays, and prevent further deterioration. Preterm infants have poor sensory processing and organization, poor muscle tone and motor coordination, resulting in limitations in daily life functions.[8] Various medical rehabilitation interventions can be given to preterm infants: therapeutic exercise, neuromotor and sensory-motor interventions, neuromuscular stimulation, joint mobilization, *positioning*, and orthosis. In this case, the medical rehabilitation interventions treatment were oral stimulation four times a day, proprioception and vestibular stimulation one time a day, and *positioning* using swaddling with *midline* flexion and *nesting* positions.[16]

The oral stimulation performed in this case refers to the method issued by Fucile *et al*.[8] The methods given such as, 15 minutes consisting of 12 minutes on the cheeks, lips, gums, and tongue area and 3 minutes for sucking exercises. During this stimulation, the position of the infant is supinated. This program was conducted for ten consecutive days, before each feeding time.[8] The oral stimulation method by Fucile *et al*[8] can be seen in Table 3.

Infants receiving oral stimulation could be fed orally faster, with a mean time of 11±4 days.[8] Meanwhile, infants who did not receive oral stimulation could be fed orally at 18±7 days. The difference was also found statistically significant (p=0.005). In addition, the overall intake of infants also increased significantly in infants who received oral stimulation (p=0.0002).[8] Similar results were also found by Pereira *et al*[9] that there was a significant difference in the time required to achieve oral feeding, which was 4 (3–11) days in the intervention group and 8 (7–13) days in the control group (p=0.003).[9]

The results of this study suggests that the provision of oral stimulation is also associated with better nutritional *intake*. Infants who receive oral stimulation, strengthen the muscles around the mouth so that they can suck adequately.[8] The stimulation also trains neuromuscular structures more efficiently and has greater endurance. This is related to the maturation of neural structures that were previously not optimally mature, especially related to the ability to suck and the coordination of sucking-swallowing-breathing. The findings prove that the concept of infant sucking maturation is not only depend on anatomical and physiological maturation but also learning experience that the learning process of oral stimulation may achieve.[10]

The Beckman method includes oral motor stimulation aims to improve the strength, flexibility, and control of the muscles around the mouth including the lips, tongue, cheeks, and jaw. It focuses on specific exercises for the muscles, such as movement of the lips jaw, and tongue which are beneficial for babies with muscle weakness or stiffness in the mouth area. This method uses gentle massage techniques used for children, while the Fucile method is more often used for

TABLE 3
Oral stimulation method based on Fucile *et al*[8]

Structure	Stimulation Steps	Purpose	Frequency	Duration
Cheek	1. Place index finger at the base of the nose. 2. Compress the tissue, move finger toward the corner of the corner of the lip (ie, C pattern). 3. Repeat for other side.	Improve range of motion and strength of cheeks, nad improve lip seal.	4x each cheek	2 min
Upper Lip	1. Place index finger at the corner of the upper lip. 2. Compress the tissue. 3. Move the finger away in a circular motion, from the corner toward the center and the other corner. 4. Reverse direction	Improve lip range of motion and seal.	4x	1 min
Lower Lip	1. Place index finger at the corner of lip. 2. Compress the tissue. 3. Move the finger away in a circular motion, from the corner toward the center and the other corner. 4. Reverse direction.	Improve lip range of motion and seal.	4x	1 min
Upper and lower lip curl	1. Place index finger at center of lip. 2. Apply sustained pressure, stretch downward toward the midline. 3. Repeat for lower lip-apply sustained pressure and stretch upward toward the midline.	Improve lip strength, range of motion and seal.	2x each lip	1 min
Upper gum	1. Place finger at the center of the gum, with firm sustained pressure slowly move toward the back of the mouth. 2. Return to the center of the mouth. 3. Repeat for opposite side.	Improve lip strength, range of motion and seal.	2x	1 min
Lower gum	1. Place finger at the center of the gum, with firm sustained pressure slowly move toward the back of the mouth. 2. Return to the center of the mouth. 3. Repeat for opposite side.	Improve range of motion of tongue, stimulate swallow and improve suck.	2x	1 min
Internal cheek	1. Place finger at inner corner of lip. 2. Compress the tissue, move back toward the molars and return to corner of lip. 3. Repeat for opposite side.	Improve cheek range of motion and lip seal.	2x each cheek	2 min
Lateral borders of the tongue	1. Place finger at the level of molar between the side blade of the tongue and lower gum. 2. Move the finger toward midline, pushing the tongue toward the opposite direction. 3. Immediately move the finger all the way into the cheek, stretching it.	Improve tongue range of motion and strength.	2x each side	1 min

TABLE 3. *Continued...*

Structure	Stimulation Steps	Purpose	Frequency	Duration
Midblade of the tongue	1. Place index at the center of the mouth 2. Give sustained pressure into the hard palate for 3 second. 3. Move the finger down to contact the center blade of tongue. 4. Displace the tongue downward with a firm pressure. 5. Immediately move the finger to contact the center of the mouth at the hard palate	Improve range of motion of tongue, stimulate swallow and improve suck.	4x	1 min
Elicit a suck	1. Place finger at the midline, center of the palate gently stroke the palate to elicit a suck.	Improve suck, and soft palate activation.	N/A	1 min
Pacifier	1. Place the pacifier in mouth	Improve suck, and soft palate activation.	N/A	3 min

infants as it relies on gentle touch. Newborns are very sensitive to touch, especially the face, hands, soles of the feet, and tummy.[8]

In addition to oral stimulation, patients are given proprioception and vestibular stimulation once a day, *positioning* using swaddling with *midline* flexion and nesting positions.[11] Previous studies have found that proprioceptive and vestibular stimulation can increase infant weight and activity and improve infant social-emotional abilities.[12] Proprioceptive-vestibular stimulation stimulates specific receptors that affect the center of the respiration system in the central nervous system. The previous research found a synchrony relationship between the extremities' breath rate and vibrational stimulation. Namely, proprioceptive receptors activate proprioceptive afferent pathways that improve human coordination between movement and respiratory rhythm.[13–15] Proper positioning of preterm infants can promote normal motor development and minimize the development of abnormal movement patterns. A systematic review study found that positioning of preterm infants, whether pronation, supination, or nesting, improved respiratory function, neuromotor development, gastrointestinal function, and sleep. The study also found that the supination position was more widely used because it was easier and could monitor the baby better.[16]

The medical rehabilitation intervention in this case showed success, characterized by an improvement in anthropometric status and NNS score. In this case, there was an increase in body weight and body length, indicating the effect of medical rehabilitation intervention on the growth of preterm infants. In addition, there was also an increase in NNS scores indicating the impact of medical rehabilitation intervention on the development of sucking ability of preterm infants. We recognized that this study has limitation given that it is based on single-case report. Therefore, future studies with observational studies or clinical trial design related to oral motor exercise are needed.

CONCLUSION

Oral motor stimulation improves oral motor skills such as sucking and swallowing reflexes in infant without organ abnormalities thus optimized good oral feeding ability and weight gain acceleration.

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